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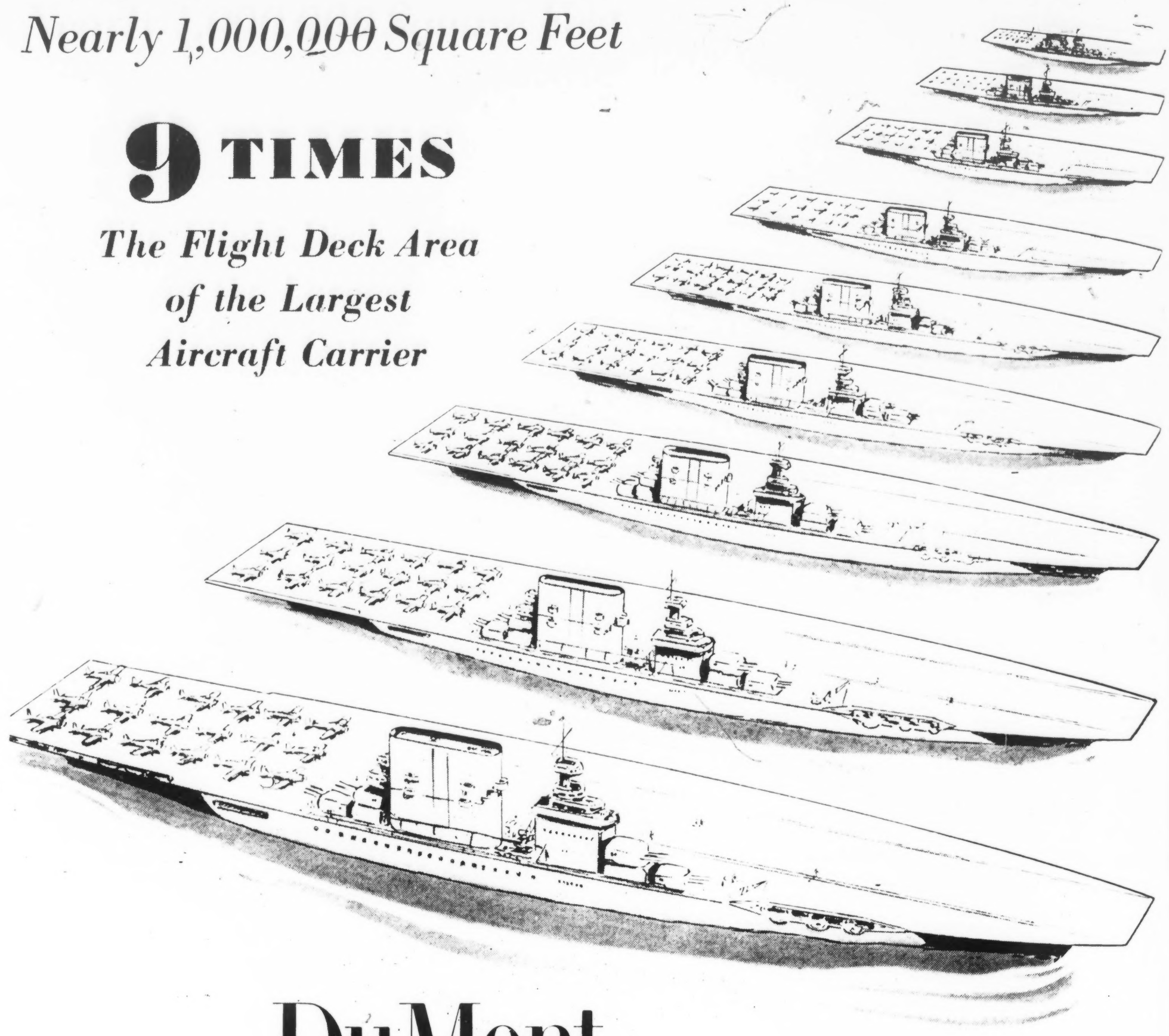

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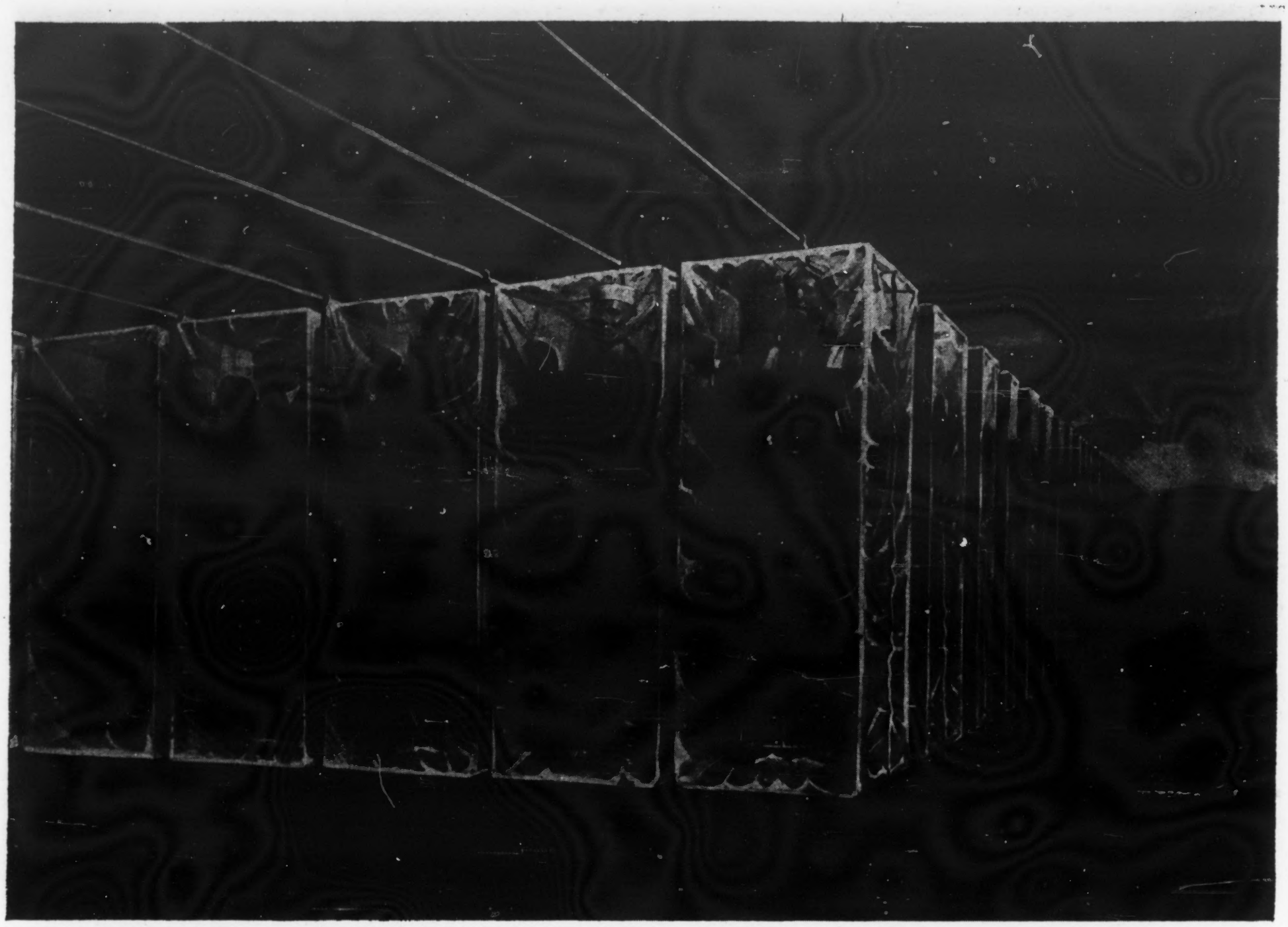

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SIGNAL

Communications-Electronics-Photography

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THE COVER

The cover photo for this issue is of the Joint Communications-Electronics Committee, Joint Chiefs of Staff. L. to R., as shown, they are Captain Wilfred B. Goulett, USN, Director of Naval Communications; Major General George I. Back, Chief Signal Officer; Rear Admiral John R. Redman, USN, chairman of the committee and director of communications-electronics, JCS; and Major General Raymond C. Maude, Director of Air Force Communications. (See story, page 48, and page 60).

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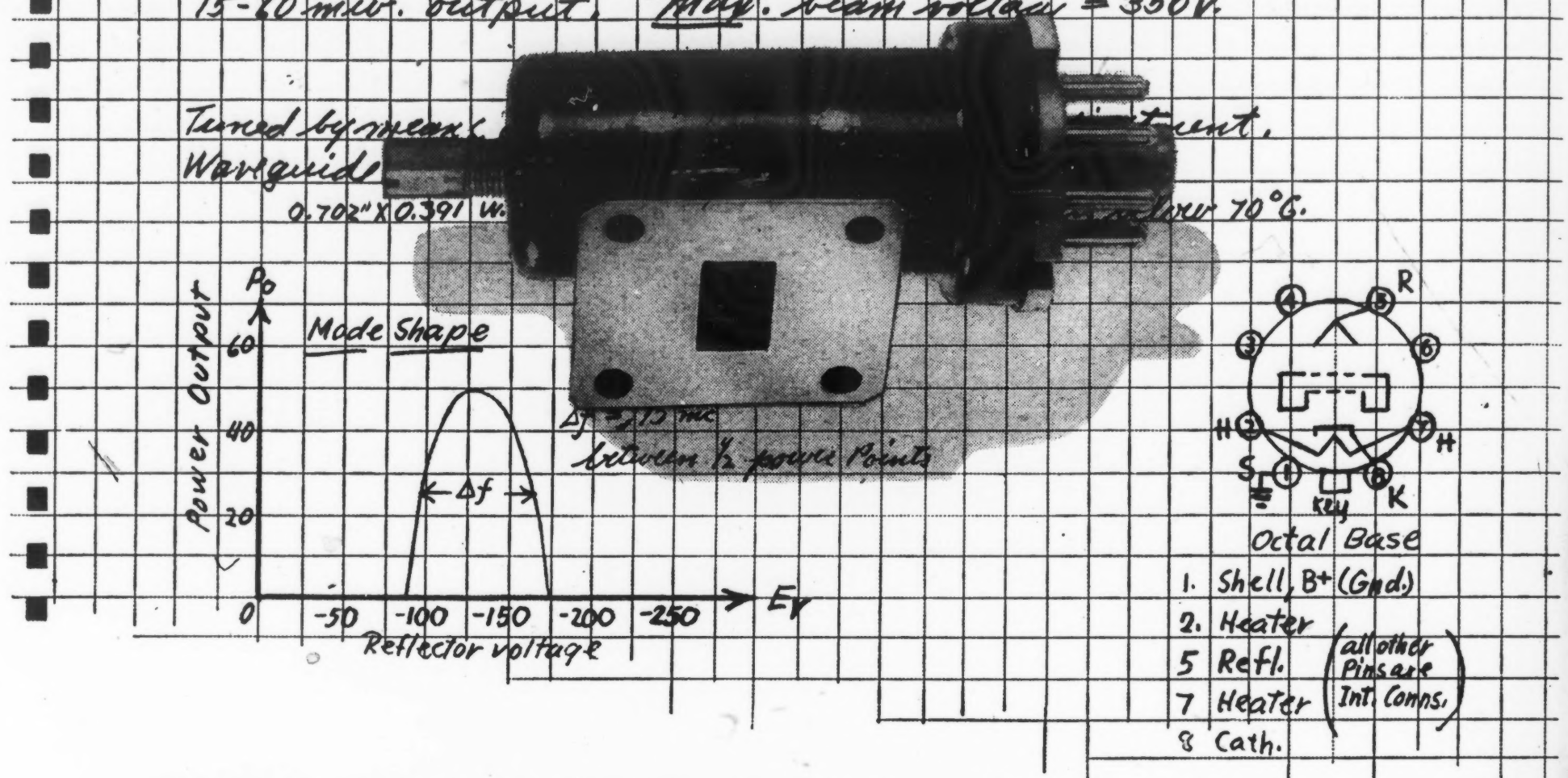

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MAXIMUM RATINGS	
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Beam Current	*35 ma.*
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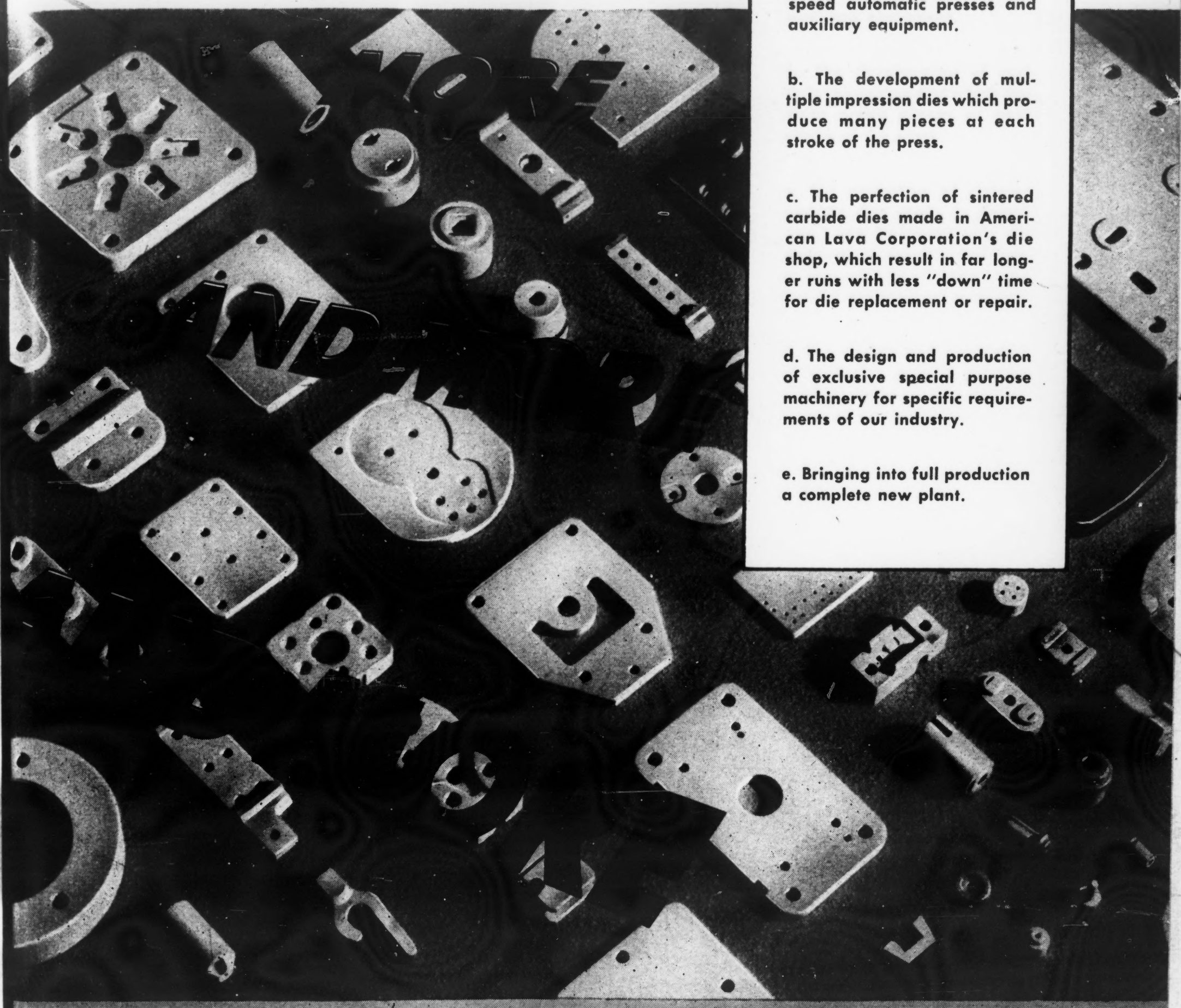

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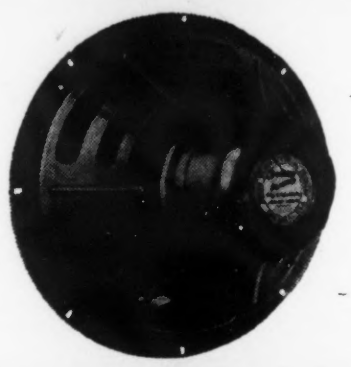

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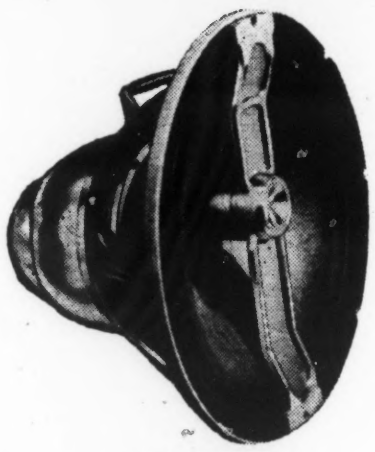

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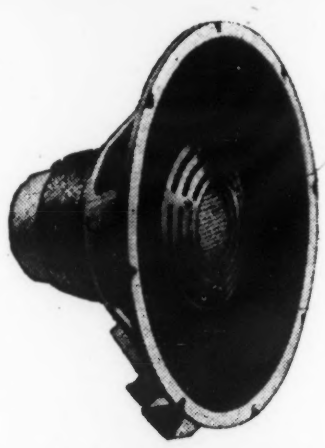

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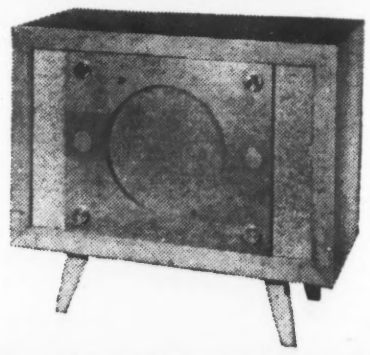

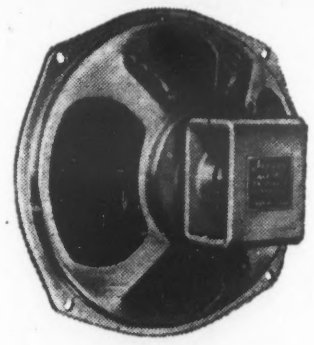

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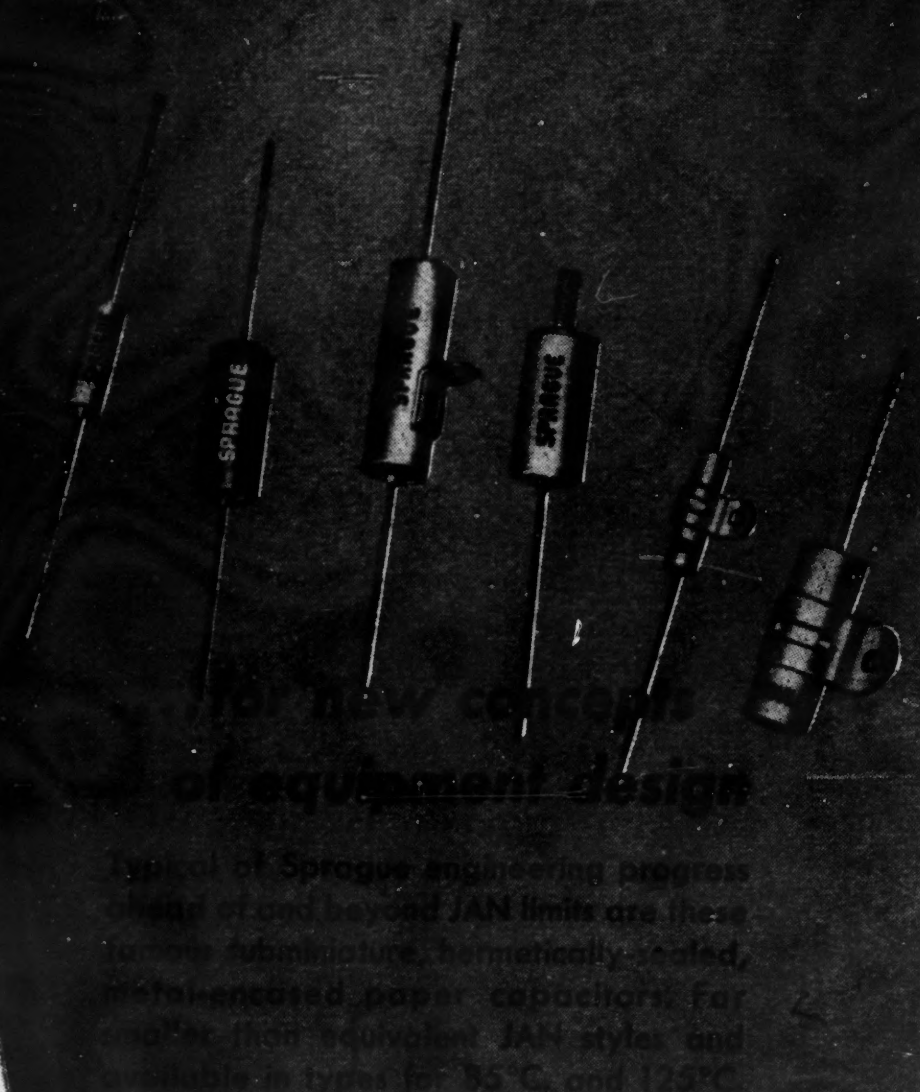

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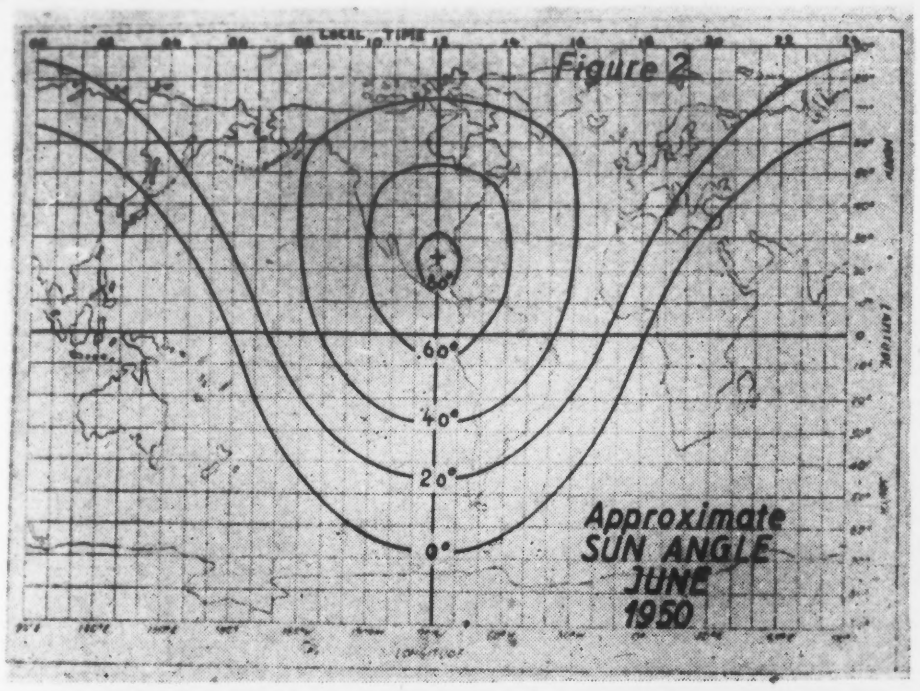

LOCAL TIME
Figure 2
60°
40°
20°
0°
Approximate
SUN ANGLE
JUNE
1950

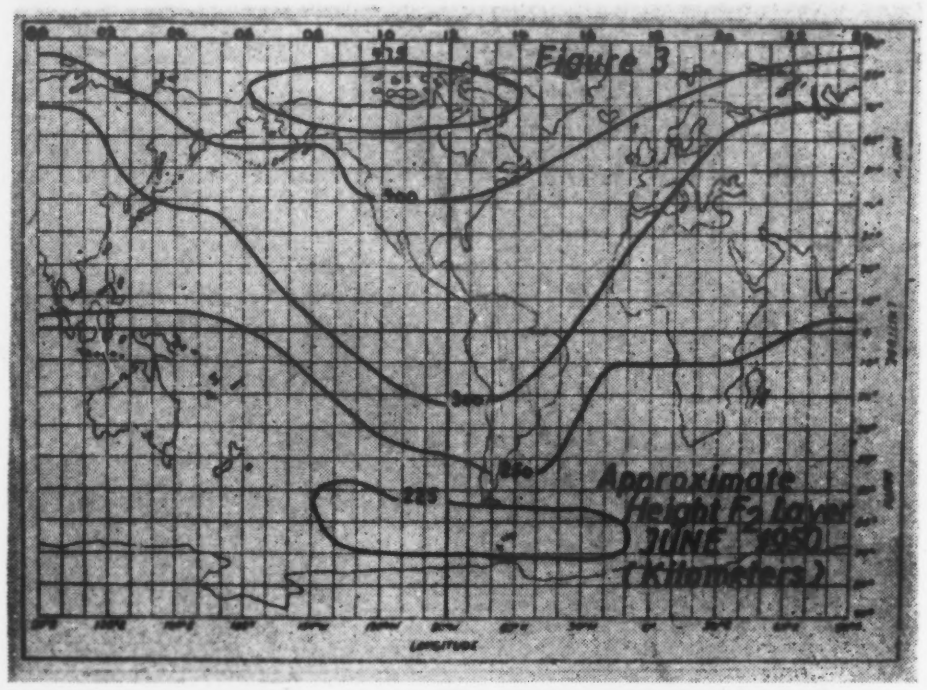
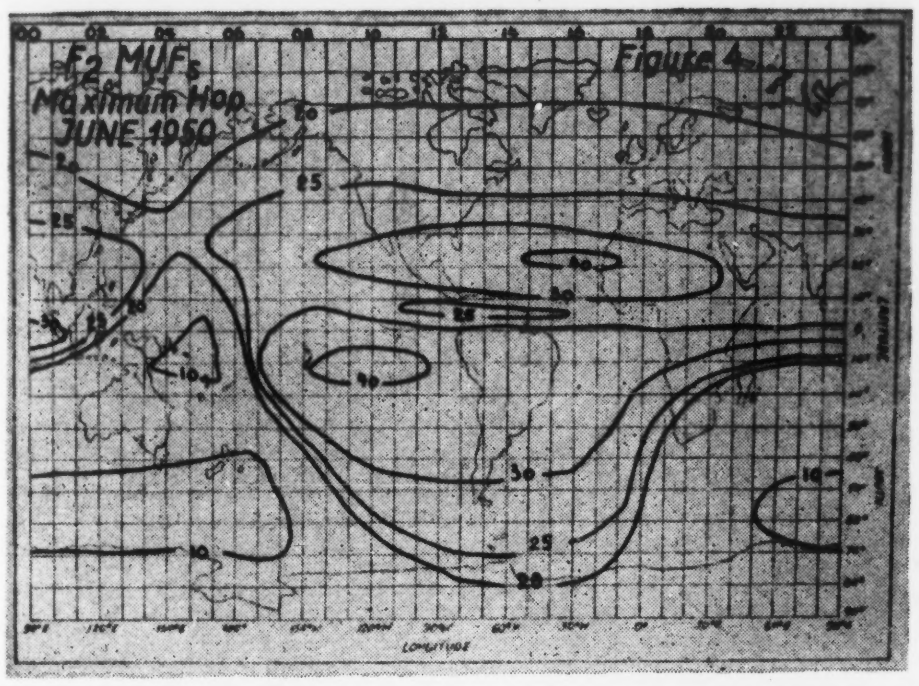
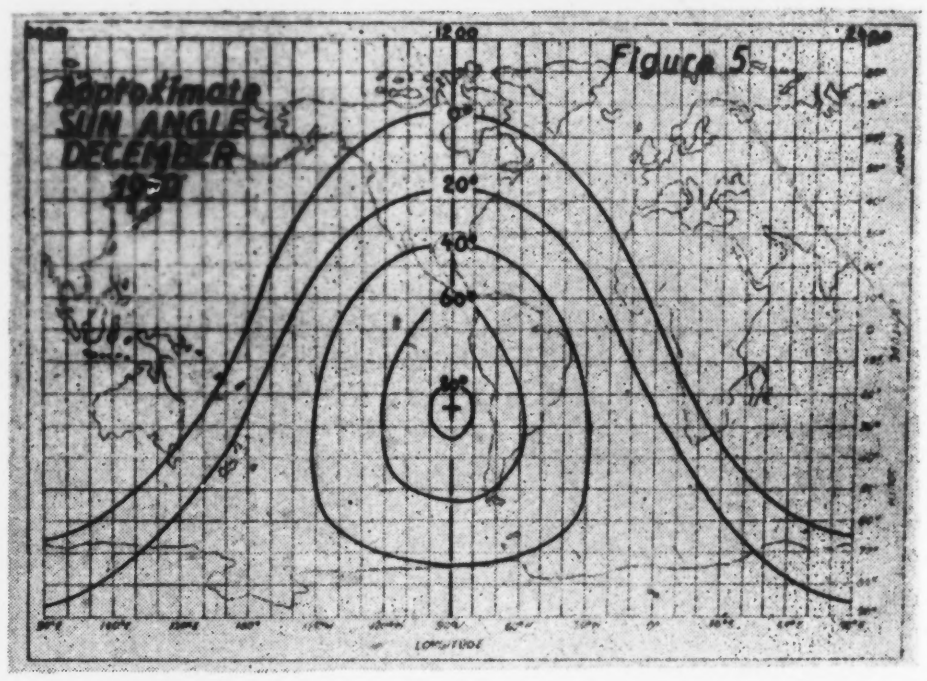
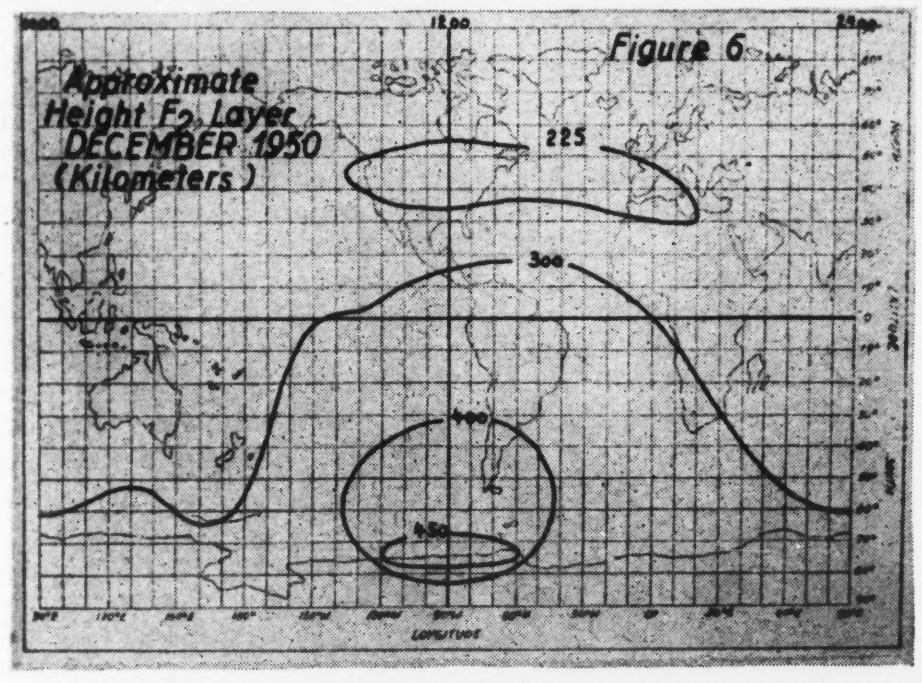
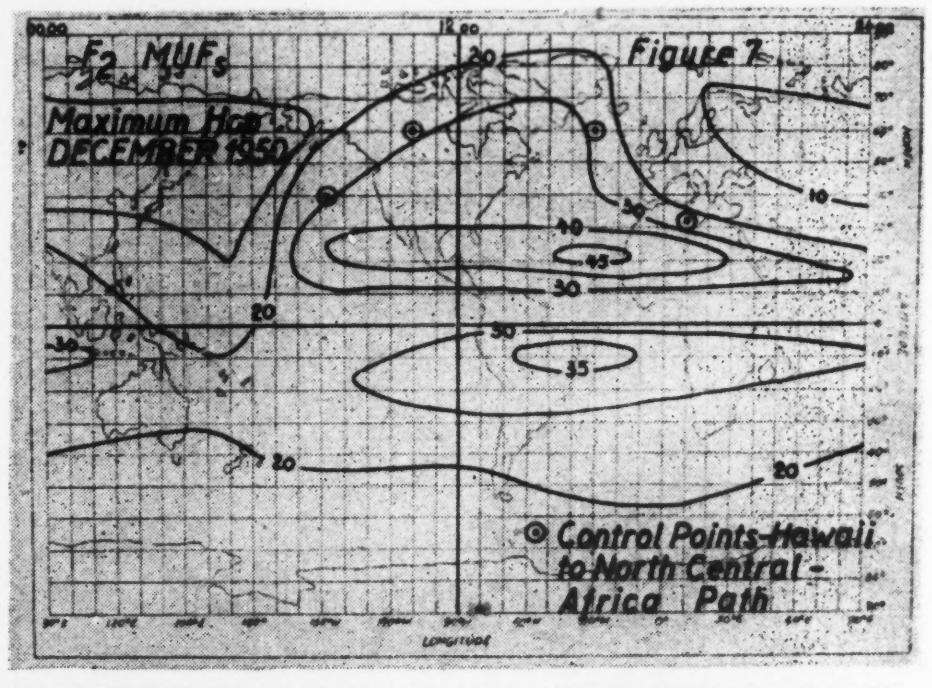


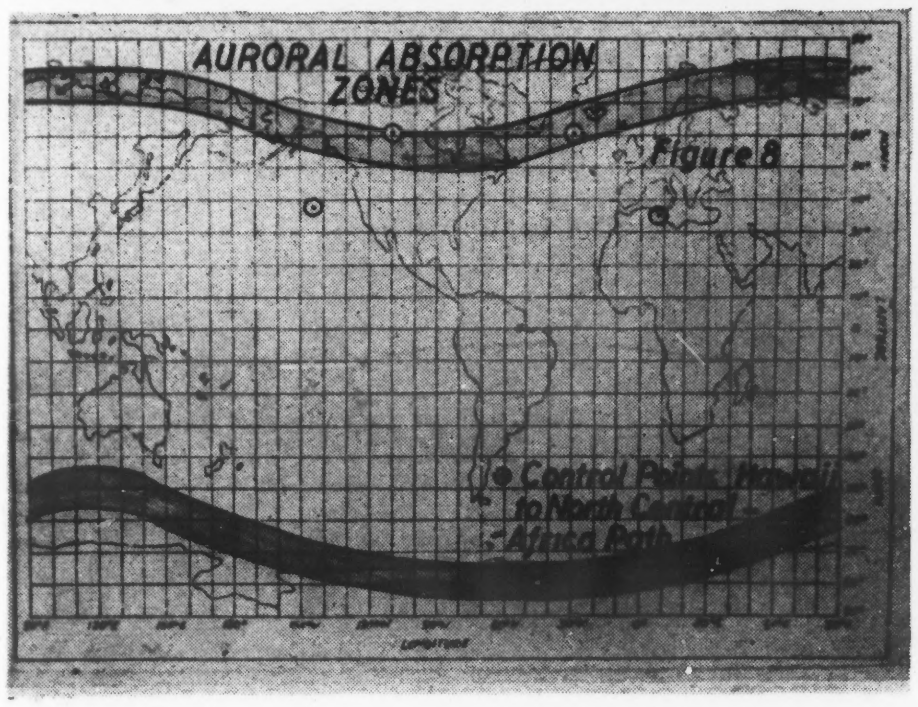
Figure 3
Approximate
Height F2 Layer
JUNE 1950
(Kilometers)
LONGITUDE


F2 MUFs
Maximum Hop
JUNE 1950
Figure 4
LONGITUDE


12.00
Approximate
SUN ANGLE
DECEMBER
1950
Figure 5
20°
40°
60°
LONGITUDE


12.00
Approximate
Height F2 Layer
DECEMBER 1950
(Kilometers)
Figure 6
225
300
400
450
LONGITUDE


12.00
F2 MUFs
Maximum Hop
DECEMBER 1950
Figure 7
Control Points-Hawaii
to North Central -
Africa Path
LONGITUDE


AURORAL ABSORPTION
ZONES
Figure 8
Control Points-Hawaii
to North Central
Africa Path

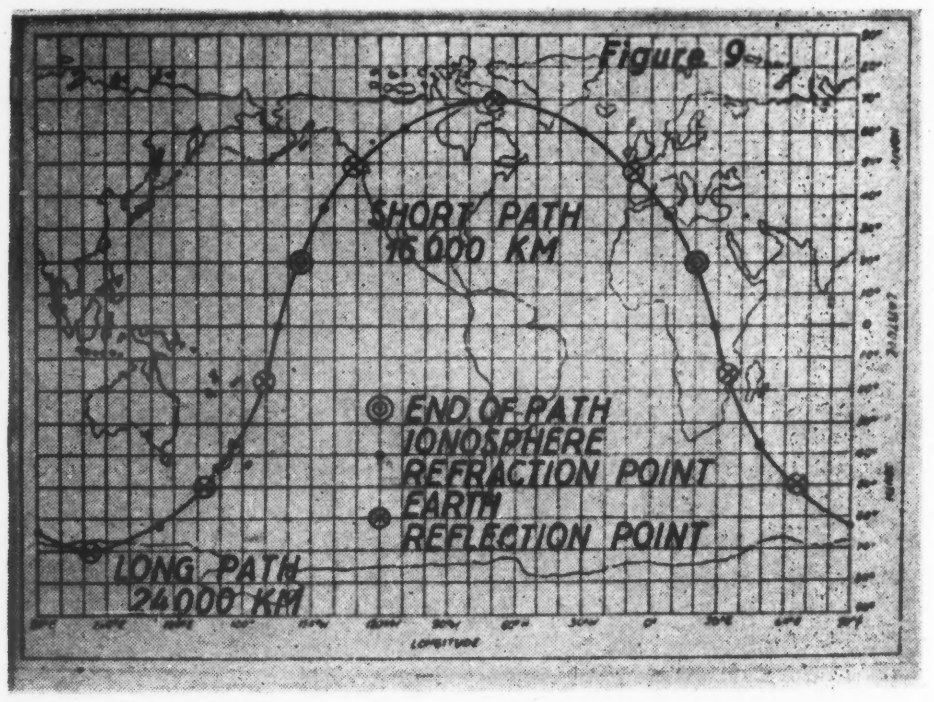


Figure 9
SHORT PATH
16,000 KM
END OF PATH
IONOSPHERE
REFRACTION POINT
EARTH
REFLECTION POINT
LONG PATH
24,000 KM
LONGITUDE

from the earth will vary the degree of ionization. We observe that the degree of incidence of the sun on a plane of unit area will effect the amount of radiation received per unit of time by the area. The sun may now be associated intimately with the ionization phenomenon considering variables of latitude, longitude, time of day, season of the year, solar cycles, sun-spot cycles, and sun rotation-periods.

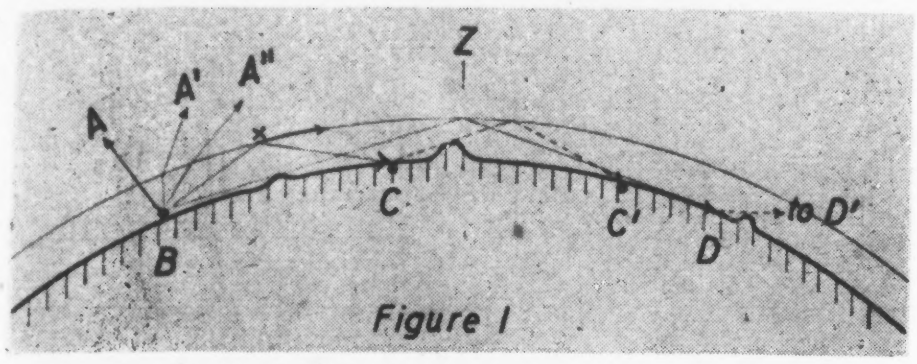


Figure 1

Turning back to Fig. 1 once again, we note that the reception of signals at point C from B depends upon the ability of the ionosphere to "reflect" from a specific area "X" at a given frequency of transmission. "X" thus becomes the *control point* of the transmission. Whether or not we can complete a one-hop circuit between any two points depends upon the frequency used, the virtual height of the ionosphere, and the virtual ion density at the control point, providing we neglect noise and absorption

Now for our geography—and forgive us a quote:

"Fill up the glass, Bartender, and I'll tell you a story that'll make your blood run cold."

Please observe Fig. 2. Here at noon, sun time, on a day in June, in the year 1950, on the northern tip of Yucatan, Mexico, the sun was *directly* overhead. All of which had a pronounced effect upon many things. Most of the good people below the 0° curve went to bed or to a night club because of the simple fact that it was night in this area. The Caribbean Sea soaked up the sunshine. The radio operator on the *SS Bananaboat,* bound for New Orleans from Honduras, threw his static-infested head-set against the bulkhead and stormed to the deck. The ionosphere shifted slightly and, at the split second of high noon, was arranged, approximately, as given in Figures 3 and 4.

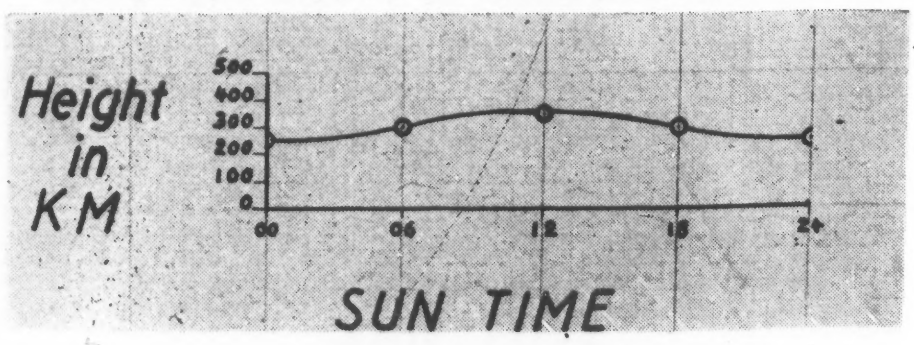
The noon time-axis as shown in Figures 2, 3 and 4, is at 90° W longitude. This axis, *with the contours,* moves over the map, to the left, at the customary speed of 15 degrees per hour. We, therefore, note local time indications at the top of the diagrams.

We note that the lowest F_2 layer height is near the south pole and the highest F_2 layer height near the north pole. The highest point of the layer is *not* above Yucatan, as we might expect. Peculiar, isn't it?

The F_2 MUF contours for long distance (maximum for one hop transmissions) appear peculiar too! In Figure 4 we see the relationship between day and night MUFS in the northern hemisphere with the lowest MUFS occurring at about 0400, local time, and the highest at 1600. This is similar to pre-dawn low, and mid-afternoon maximum, temperatures. The split of maximum MUFS astride the equator, which we must note, also is peculiar *but normal.*

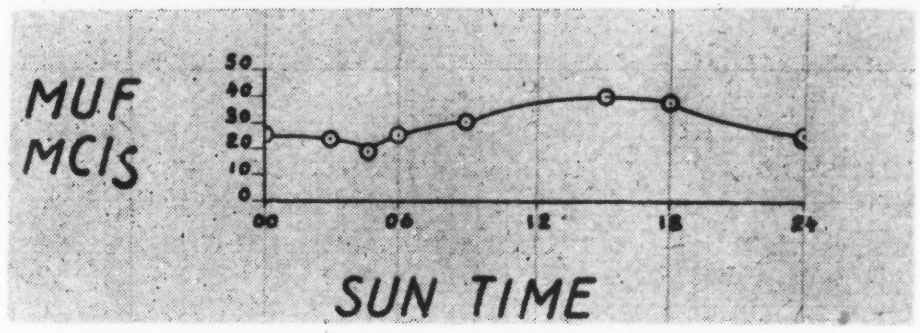
Now, providing the midpoint of a long-distance radio transmission path coincides with the Yucatan point (90° W —22° N), the ionized layer directly above the point is defined as the *control point* for the path. Let us consider the ramifications of this situation for the plethora of possible paths. (*That* word was plucked from a recent, official communciation. We thought it just too, too euphonious to submerge in the files.)

The F_2—layer height, at the control point, varies like this:

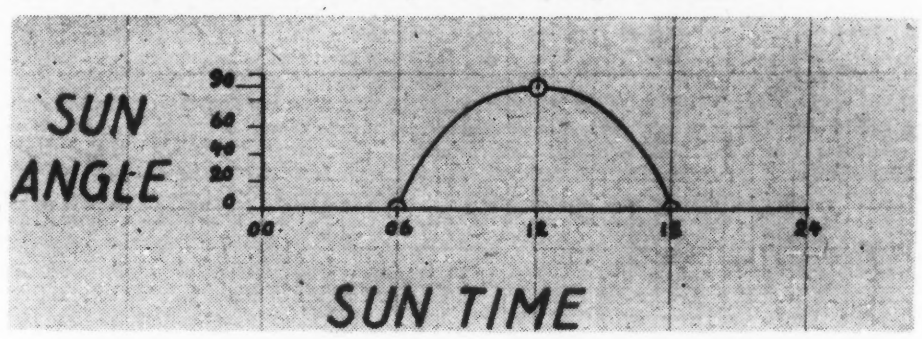


Col. Loren E. Gaither's first article for us appeared in our July-August 1949 issue. Following its publication the requests we received for permission to reprint the piece hit an all-time high, and still remains the record, for reprint permission requests for anything we've ever published. The originating points of the requests, as well as the volume, were notable—schools, industry, the armed services, and several foreign journals. We regarded those requests as confirming what we had earlier come to feel, that Col. Gaither in his writings had demonstrated the possession of a sizable talent. Manifest in his work is sharply analytical technical thought, unusual ease and clarity of presentation, and a wittiness which might well be unique among technical writers. Col. Gaither is presently technical director of the American Forces Network in Europe, and formerly was chief of the communications banch signal division, EUCOM. His World War II service included 17 months in the CBI as signal officer with the 69th Composite Wing of the 14th Air Force Tactical Air Command.

The MUF at this control point (for 4000 km or about maximum—one-hop paths) varies like this:



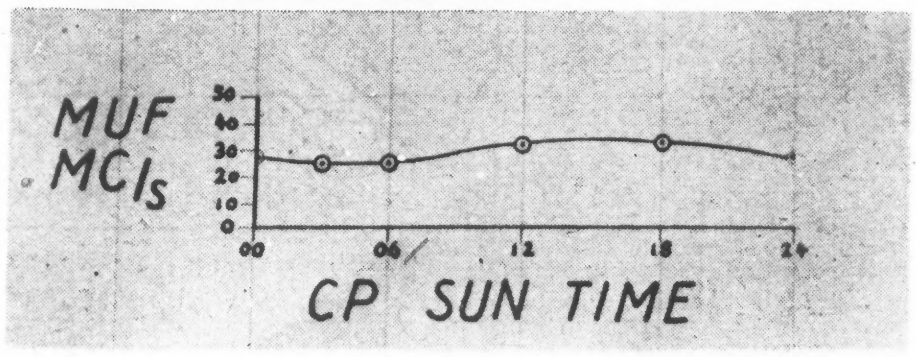
All of which was a direct result of the angle of incidence of the sun on the control point varying like this:



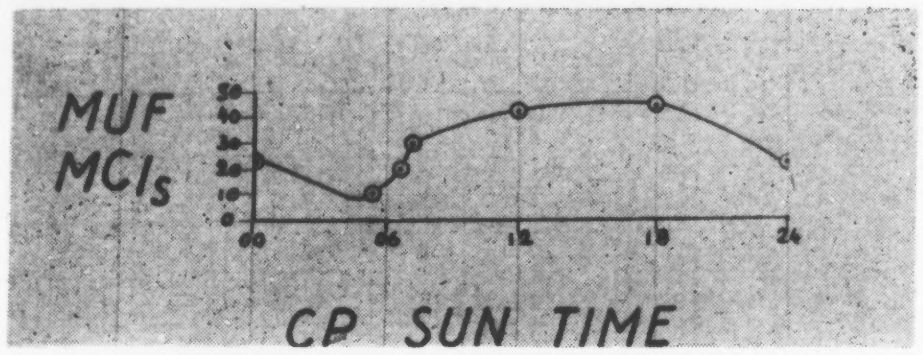
The F_2—layer height-curve indicates that the longest one-hop paths will occur in the middle of the day. The MUFS curve indicates that we can expect our best transmission in the afternoon and our worst around sunrise providing we change our frequency to follow the curve of "maximum transmissions," the MUFS. The sun-angle curve indicates that nighthawks have from 1800 until 0600, Yucatan Local Time, in which to do their hawking.

With attention upon Figures 5, 6 and 7, which are for December 1950, we note that the hours of darkness are about the same in number for the Yucatan area, that the maximum F_2—layer height has gone south but, for some peculiar reason, the F_2 maximum of MUFS remained at the same north latitude.

Actually, if our transmitter and receiver sites were both located with the control point on the 20° South parallel, our MUF curve would look like this:



If, however, during the *same* month, our transmitter and receiver sites were both located with the CP on the 20° North parallel, our MUF curve would look like this:



These indicate that the south path may work satisfactorily on the same frequency, day and night, under these conditions. The boys up north, however, will be up all night, changing frequency. This is not, we repeat not, a general axiom! It just so happened in December 1950.

We continually hear claims that North-South paths are better than East-West paths but, providing we have the same control point, we argue that the azimuth of the path doesn't alter the results one iota, providing we neglect local noise levels at receiving points and consider one hop transmission only.

Actually, the reason why continual high MUFS exist in the northern hemisphere is that during summer the sun angle is high; in winter the earth is 2.8 million miles closer to the sun at the perihelion. Both tend to hold the ion density high.

At this point we have assembled most of our tools for multi-hop paths. We wish, nevertheless, to add a phrase of caution before we describe the process of prediction. We shall not guarantee a correct solution—but the results should be 85% right. Note, also, that we are not solving for LUFS but for MUFS. Situations are considered normal on most multi-hop paths when the LUF actually is higher than the MUF at certain times of the day. Then, as the Chinaman said, "No workee!" About all one can do is to increase the transmitter output or to increase the gain of the antennas in an attempt to effect the circuit—man-made interference being assumed *not* to be a factor.

Figure 8 indicates zones of maximum auroral frequency. These result from the concentration of cosmic particle radiation by the converging magnetic lines of force at the polar regions. The overall effect is to produce very intense ionization in the layers below the F_2 layer and to create abnormal absorption. Control points falling in these zones create headaches for the communicators.

We also remind one that there are no "curve-balls" in radio. All paths are straight. One may pick either the short path or the long path and we shall overlook scatter as a possible curve-factor. Please look at Figure 9.

The path shown in Figure 9, like the old saw about the swinging doors, is a good thing to avoid. Here we have control points in the auroral absorption zones and extreme MUF conditions at the ends of the path. Actually, one might well investigate the long path for a better solution than the short. Our own, pet assumption is that reflection points on water are better than ground reflection points. This was the reasoning behind the preceding statement.

We repeat: 4,000 km is about the maximum for one hop. For example, if our path is 10,000 km we would have an impossible 2½ hops if we employed the 4,000 km figures, therefore, we should use 3 hops and our control points would fall at 1,666, 4,999 and 8,332 km with earth reflections at 3,333 and 6,666 km. We will use 4,000 km for our actual solution since the length of the path is a multiple of 4,000.

To determine the MUFS curve for the Hawaii-Africa Path we use a publication, "Basic Radio Propagation Predictions, CRPL Series D" for whatever month we are interested in. These are published three months in advance by the U.S. Department of Commerce, National Bureau of Standards, in the United States of America. (Other countries probably have similar publications.) For our example we will assume Figure 7 was taken from such a publication.

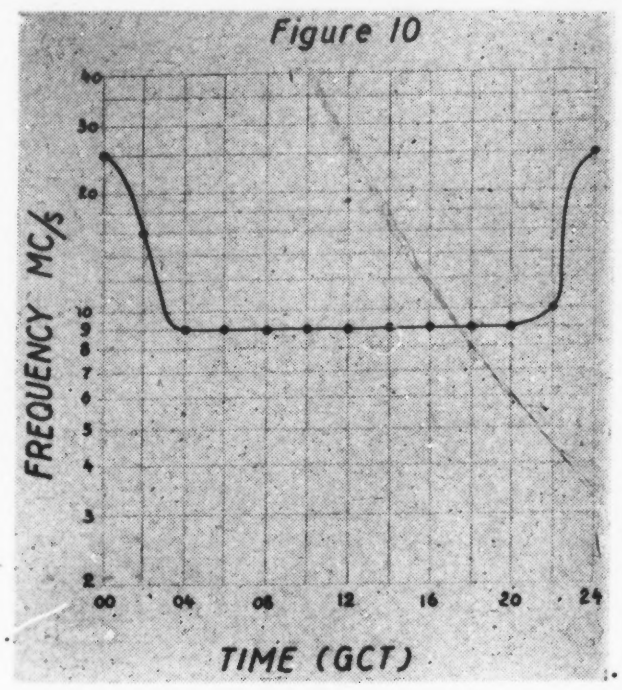
Deciding to ignore the long path, the short path of Figure 9 is traced upon transparent paper with a verticle axis at 0° (For GCT) and a horizontal axis at the equator. . . Actually, F_2 MUFS plots are found in the CRPL for three zones (areas) of the earths surface but we will use only Figure 7 for a quick example. . . If we place the path overlay on Figure 7 with the equator lines and 0° longitude lines coinciding, we read the MUFS at the four control points at 0000 GCT. Please observe the points are transferred to Figure 7 and are, from left to right:

29 — 28 — 28 — 25

The MUF at 0000 GCT is therefore 25 MC/S, since a higher frequency will penetrate the "African" control point.

For MUFS at other times of day, one slides the over-lay across the F_2 MUFS plot and tabulates the MUFS at any particular time for all control points; the lowest of these becoming the *limiting* control point. (We note the usual method is to use only the end CPs.) Actually, the result is shown in Figure 10. The curve of MUFS in Figure 10 is discouraging since absorption and noise probably will make the path inoperable except for a period of an hour or so around 0000 GCT, when the MUF is maximum.

Figure 10



Whether or not the path will work can be decided only by solving for the LUFS—and what a job that is! In fact, an entire article could be written upon it. In fact, the good people in the propagation business have yet to publish "the thing" which the author believes to be highly desirable—a quick and easy reference for solving LUFS. That, good people of the propagation business, was intended to be an invitation and not a complaint. After all, it is realized that all of the following factors are involved:

a. Degree of cosmic, atmospheric and man-made noise.
b. Type of service (CW, RTT, Phone, etc.)
c. Types of antennas, orientation and height.
d. Degree of path absorption.
e. Mode of propagation.
f. Amount of power radiated.
g. Noise factor of receiving equipment.
h. Sensitivity of receiving equipment.
i. Number of jug-heads, if any, involved in operating the circuit. (A jug-head is an individual who knows better and cares less.)

Anyway, for the most important statements in this entire article—"To compensate for daily variations we shall define the FOTS as 85% of the MUFS. Then, *stay as close to the* FOTS *as possible and one has a good, gambling chance of getting the maximum number of hours of communication out of the path.* If the maximum is near zero, don't blame the FOTS; blame the LUFS."

The author believes that paths, in general, involving control points in the 30°—40° North or South latitudes are best. This is a personal observation and may be confirmed or denied by anyone having the time for research.

If one is interested in a comprehensive treatment of this subject, we invite attention to "Ionospheric Radio Propagation, U.S. Department of Commerce, National Bureau of Standards, Circular 462," for sale by the Superintendent of Documents, U.S. Government Printing Office, Washington 25, D.C. Price $1.00.

Now, all one has to do, to make a million bucks, piasters, kopecks, or what-have-you, is to figure out how to transmit an ionizing ray with the radio ray or how to plant a fixed, space-base as a CP ionizing station.

Wethinks, forsooth, either of the above would be a hair-saver for many an olde communicator.

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A New Requirement of Dependability In Diesel Power Units

One of the most demanding assignments ever handed to engine manufacturers is the requirement of the communication field for equipment to power isolated communications equipment. New standards of dependability under every conceivable operating condition enter into the planning of this new and rapidly growing phase of communication.

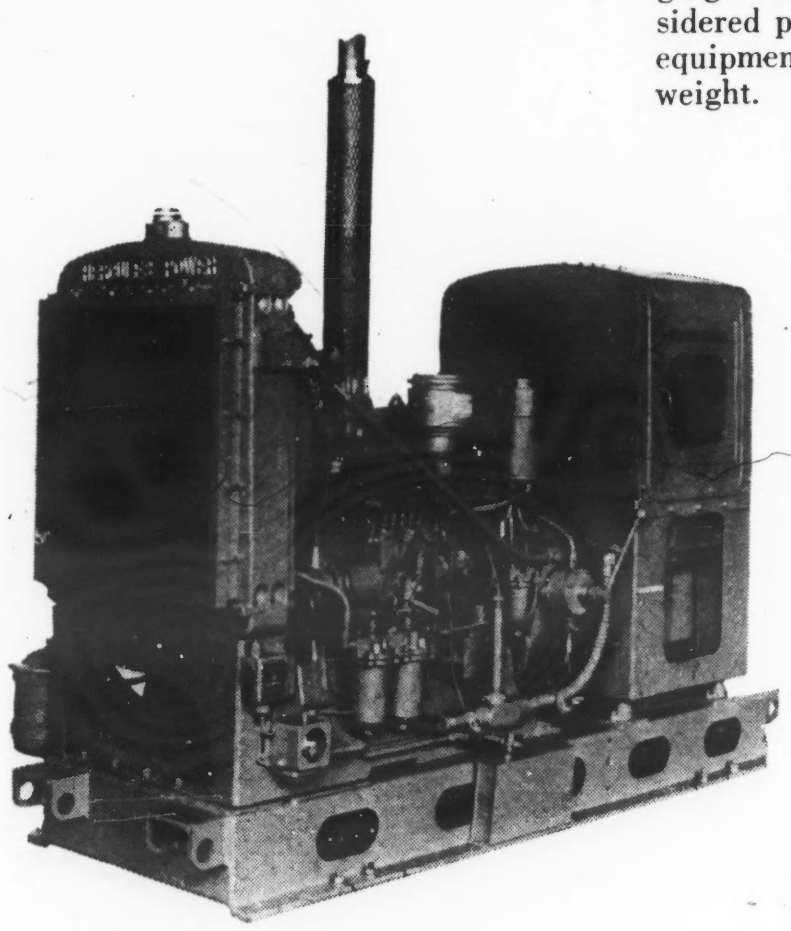
For years, internal combustion engines have been capable of functioning dependably without constant watching or maintenance and without any degree of "handholding" care. But the development of communication equipment that must function automatically and dependably for months at a time in isolated areas, which are in some seasons of the year virtually inaccessible, poses a new set of requirements. Meeting these requirements has been one of the interesting experiences of Hercules Motors Corporation of Canton, Ohio,—pioneers in the development of modern gasoline and diesel engines.

Facilities, experience and background enabling Hercules to successfully handle assignments of this type date back to 1915 when four industrialists met in a hotel room in Canton to discuss the future of horsepower in terms of an ever expanding diversity of engines.

Engines were already in use in automobiles, in the primitive airplane of those days, and in many other places where power was needed. The idea of diversification . . . engines for everything . . . caught on like wild-fire. Hercules was definitely in tune with the time and the trend. Civilian use of power was increasing in ways unknown to previous generations. And, the variety of engines manufactured was constantly increased. Each new application was a challenge. Hercules engines went to work in all phases of industry—communications, agriculture, transportation, oil fields, construction—wherever dependable power was needed.

Above: An unusual view of the Cisco-Butte, California station of AT&T's long lines transcontinental radio-relay system. This station is located in a valley high in the Sierra-Nevada Mountains. For other photos of radio-relay stations in new transcontinental system, see next two pages.

Approximately 16 years after Hercules introduced its light-weight, high-speed, heavy-duty gasoline engine to the trade, this company took its first step in the pioneering of the light-weight, high-speed, heavy-duty diesel engine. Although diesel engines had already been recognized for their inherent economy and tremendous "lugging" ability, they had not been considered practical for powering portable equipment because of their great weight.



Left: The Hercules Model DJXH, powering a Western Electric Microwave Relay Generator Set.

Hercules engineers designed a diesel engine in which the weight-per-horsepower, size and speed closely approximated that of the gasoline engines already in production. The Hercules diesel featured a new type of patented combustion chamber which contributed much to the immediate acceptance and proven performance of this unit.

Today, and due in a large measure to the policy of always accepting the challenge presented by a new application for horsepower, Hercules Motors Corporation of Canton, Ohio ranks as the world's largest exclusive independent manufacturer of both gasoline and diesel engines.

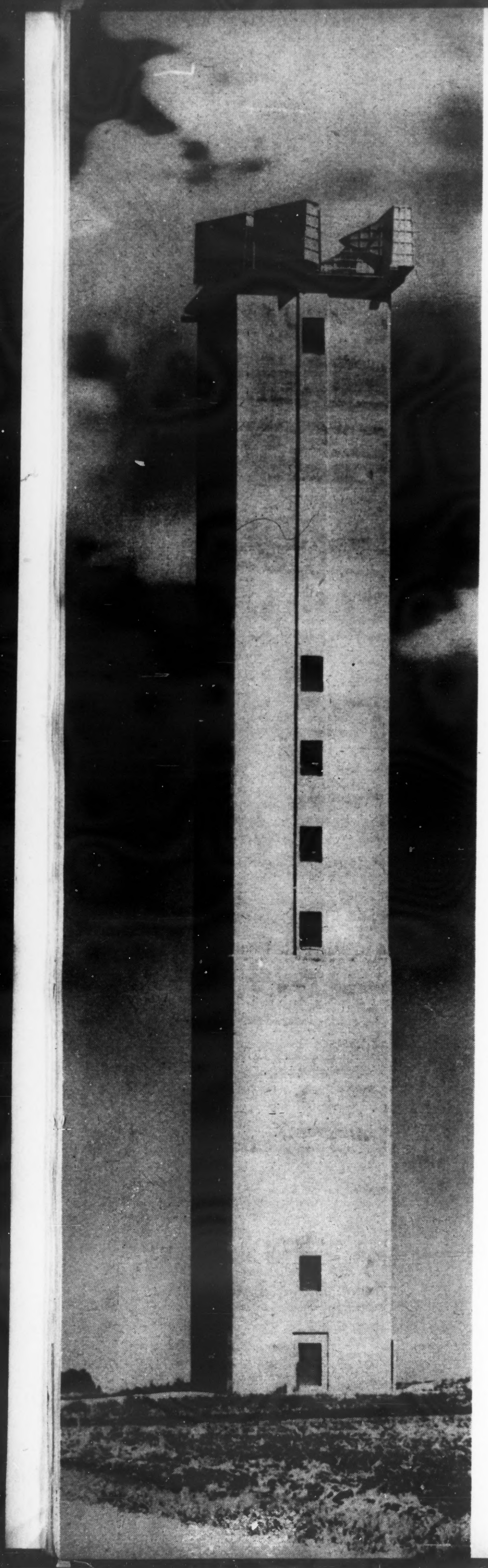
The following applications are recent examples of how Hercules engine building experience is being applied to solve modern power problems.

Microwave Tower Function

The advent of the commercial development of radio relay has brought about another new requirement for gasoline and diesel powered electric generating equipment. These units are used to meet the need for standby power at many microwave relay towers which have been flashing television programs across large sections of the nation and at those which just recently began spanning the country with inter-city transcontinental television facilities and public telephone service. Many densely populated areas of the nation owe their ability to receive "live" television broadcasts to the rapid expansion of microwave-relay systems being used as an alternative to coaxial cable extensions. In fact, about one half of the total television channel mileage is provided by radio relay, the remainder by coaxial cable.

In most instances, local power lines are available for the operation of the microwave towers which perform the dual functions of receiving the picture image waves at one horizon limit and transmitting them onward to any de-

(*Continued on page* 72)

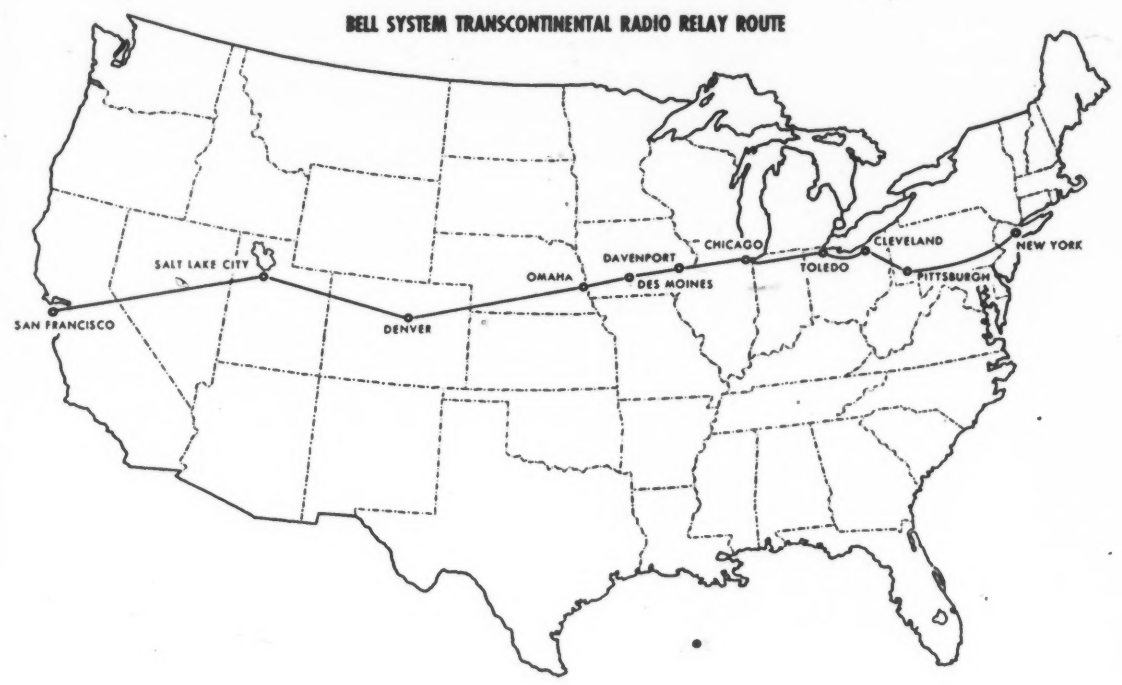


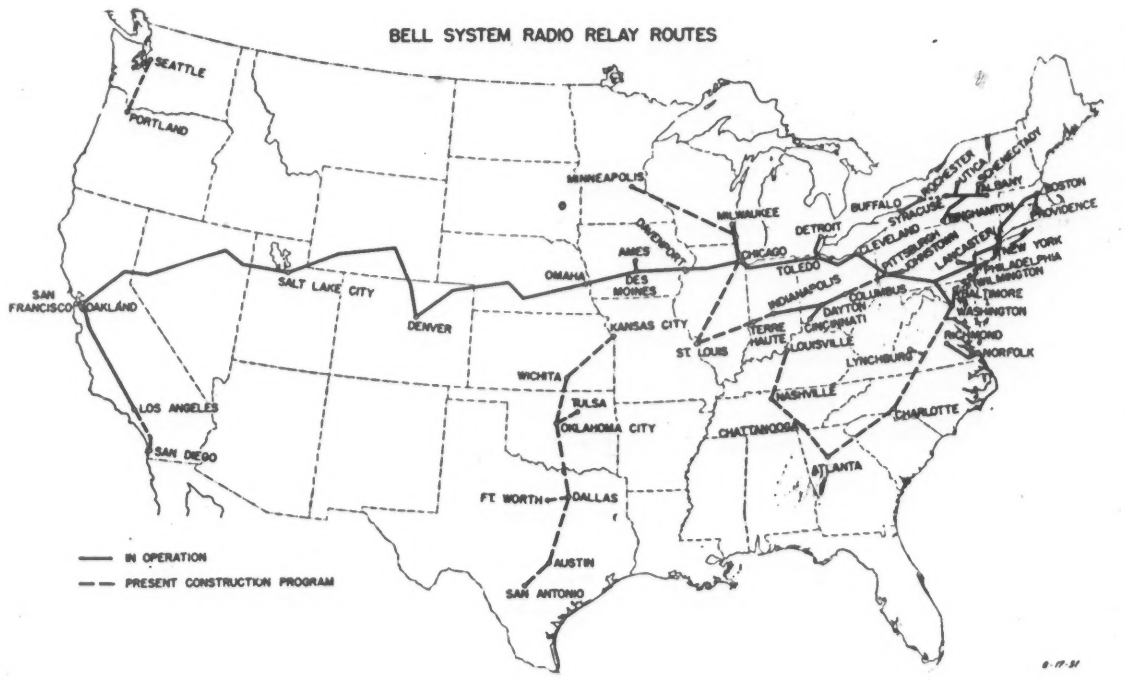
Transcontinental Radio—Relay System

On August 17 the longest microwave system in the world began sending telephone calls by radio across the United States from coast-to-coast, and by means of the same route the opening of the Japanese Peace Conference on September 4 could be seen on television all the way to the East Coast. The opening of the system was, as termed by FCC Chairman Wayne Coy, "truly an historic occasion in the development of American communications."

On these pages are shown some of the way stations of the new Bell System microwave radio-relay chain which was three years in building, at a cost of $40,000,000. There are 107 such microwave towers in the chain, spaced about 30 miles apart.

In setting up the transcontinental system the Bell Laboratories were involved with a new set of problems because of the tremendous distances to be covered and the large number of radio channels required. Three new developments provided the answers—first, a new electronic tube outstanding in performance at super high frequencies; second, a greatly improved metal lens which would handle thousands of simultaneous telephone calls; and third, a unique system of filters representing an entirely new contribution to the field of communications. This equipment was made and installed by the Western Electric Company, manufacturing unit of the Bell System.





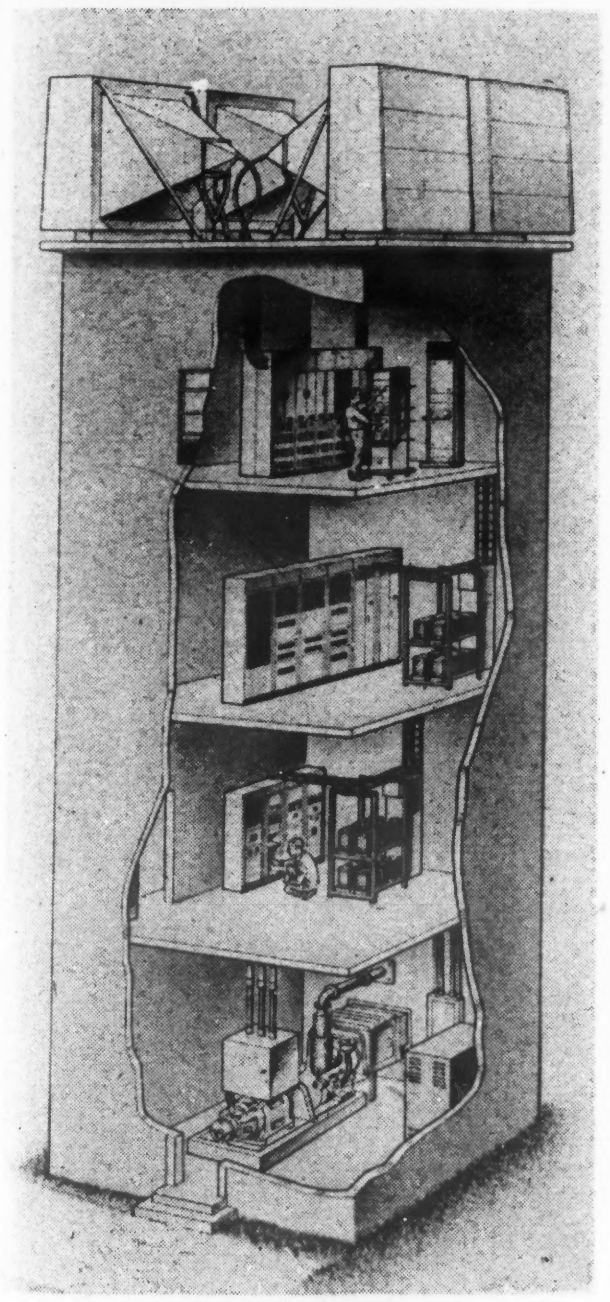
Radio-Relay station at Creston, Wyoming, showing receiving and sending microwave antennas at two different levels.

Electronic "Pony Express"

An air view of the Mt. Rose, Nevada station. At an elevation of 10,000 feet, this is the highest station on the system.

One of the 107 stations on the system, this two hundred-foot tower at Salt Lake City Junction overlooks Salt Lake City and in the distance, Great Salt Lake.

Schematic drawing, showing a cut-away view of a typical concrete station.



Communication Waves

These Navy women have proven that the feminine touch can be appreciated in the field of communications as well as in their more accustomed roles in life . . .

Left: Lieutenant Norphlet Scott, WAVE, USN, has been on active duty since June 1, 1944 and is the first WAVE officer to be assigned to the communications course at the U. S. Naval post graduate school, Annapolis, Md. Lt. Scott is enrolled in the current class which commenced July 5, 1951.

A graduate of the 42 week electronics technician school, Great Lakes, Ill., Joan Rataczek, electronics technician third class is one of three rated WAVES holding this title. Before joining the Navy in 1949, Miss Rataczek was a laboratory technician. Her present duties consist of the maintenance and repair of communications facilities at the Navy Radio Central, Washington, D. C.

PLANNED TRACK-VECTOR CONTROL CONCEPT

An Operations Concept

By T. J. SIMPSON

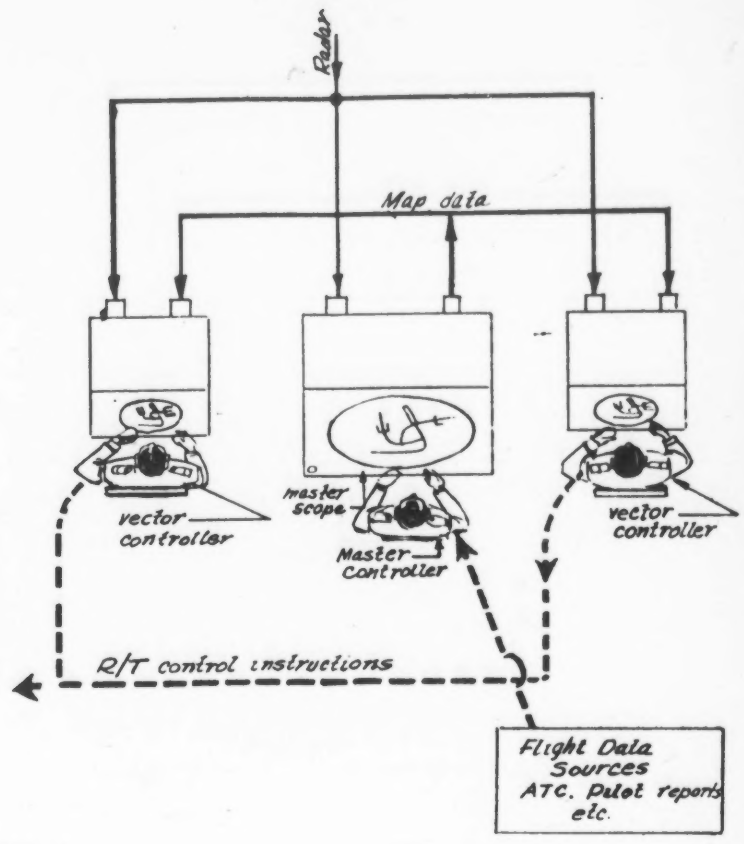


Fig. 1.

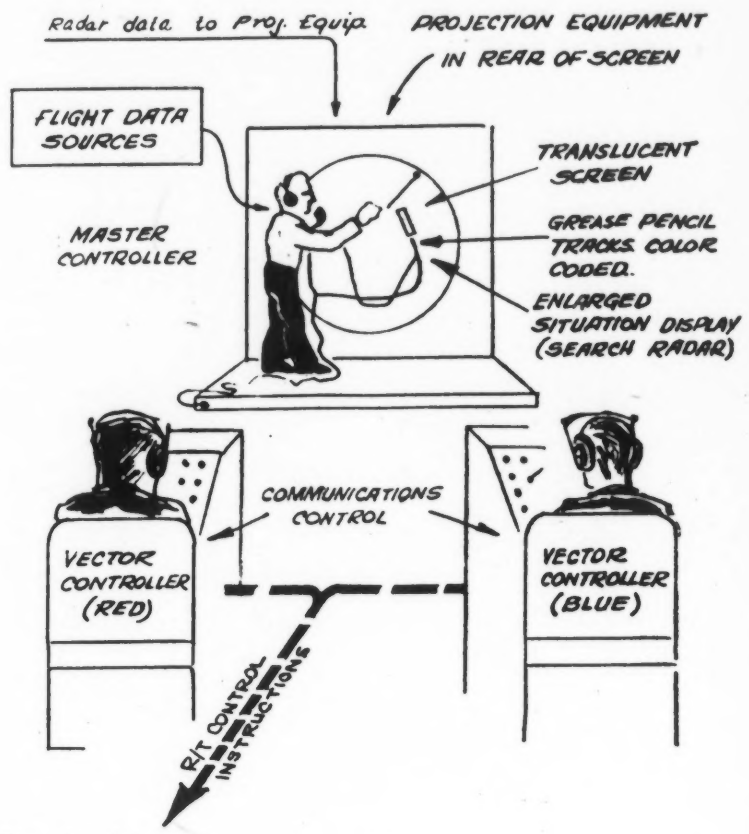
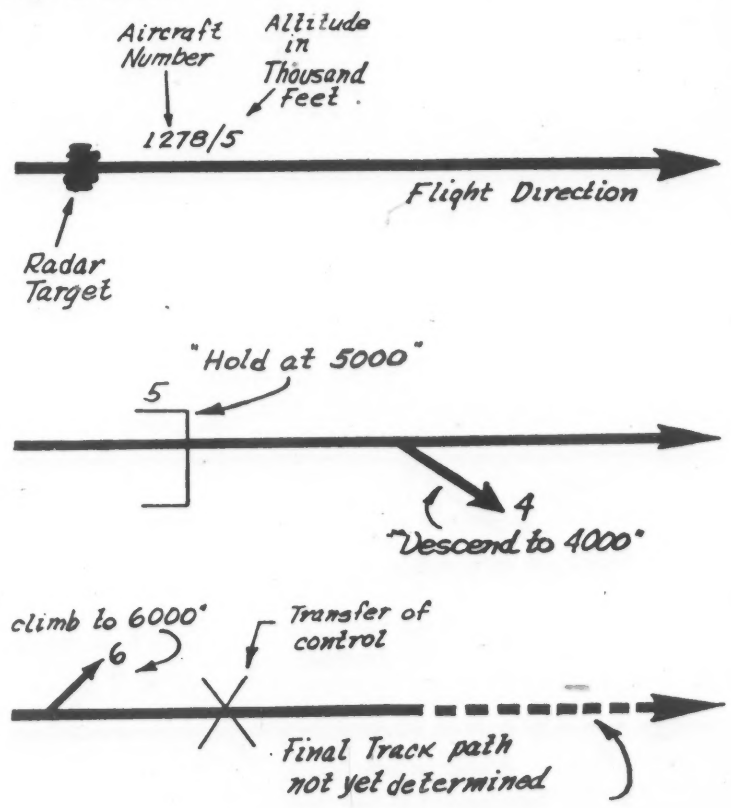


Fig. 2. above

Fig. 3. below



1. The problem of efficiently manning a Radar Air Traffic Control (RATC) Center is one concerned with getting the maximum utilization out of an operator's potential control abilities without reducing the safety and traffic handling capabilities of the system. In order that radar air traffic control can be economically justified, ways and means must be sought out that will improve the ratio of the number of aircraft controlled per individual controller (AC/C), otherwise personnel figures will reach values completely out of proportion to the air traffic handled by a RATC facility.

2. In the present method of controlling air traffic by radar within an airport approach control zone, a radar controller is placed before a conventional radar search scope and the following duties delegated to him:

a. He must spot or pick-up a radar target when it first appears on his screen and correlate (identify) it with the aircraft producing this target. This function is generally known as "pick-up and identification" and requires quite a bit of ingenuity on the part of the radar controller to perform this duty and insure that his identification is correct.

b. Once he has satisfied the foregoing requirement, he must plan next the flight path of this aircraft as governed by the over-all situation within the approach control zone at that moment. This planning must be accurate so that the aircraft's maneuvers and effects of its maneuvers on the flight paths of other traffic are kept to an absolute minimum. It is obvious that this planning must not generate delay within the traffic pattern.

c. Additionally, the controller must be ever-alert to take advantage of situations that may develop that will enhance the operation outlined in b, above, in addition to being immediately aware of those little tell-tale conditions that spell out the eventual development of future hazardous conditions if permitted to continue uncorrected.

d. Communications is the only means of exchanging intelligence between the pilot and controller, hence, once the controller has available all of the information bearing on the operation of this aircraft, he must issue proper radiotelephone instructions so as to cause the aircraft to proceed along a designated flight path in accordance with his planning.

e. It follows, therefore, that for each aircraft in the pattern, the controller must repeat all of the above operations.

3. Radar targets, unfortunately, have the extremely undesirable characteristic of all looking exactly alike on a radar screen. There is no "built-in" identity feature in radar target responses.

4. Beaconry will tell an operator that a particular target belongs to a certain aircraft only so long as the beacon is operating, and it has been learned from operational experience that it is highly undesirable to have a flock of aircraft milling about in an approach zone with beacons operating continuously. This is due to the fact that the beacon responses look exactly like aircraft targets themselves, and

where intermixed on a screen, present a confusing picture to the operator.

5. It is obvious, therefore, that the memory burden imposed on an operator eventually becomes impossible at the number of targets appearing simultaneously on the radar screen increases. Present day operations indicate that an unaided controller can handle about four separate aircraft. Above this figure, his attention becomes too divided to permit safe, high density operations. As a rough figure, for each four aircraft simultaneously in the pattern, an additional scope and operator are required so that in an area where 15-20 aircraft is not an uncommon operation, five controllers would be required. In addition to these personnel, it has been found desirable to have a controller assigned the singular mission of "feeder control," whose duty it is to accept aircraft from the pattern controllers and feed them into the landing control facility (GCA or ILS).

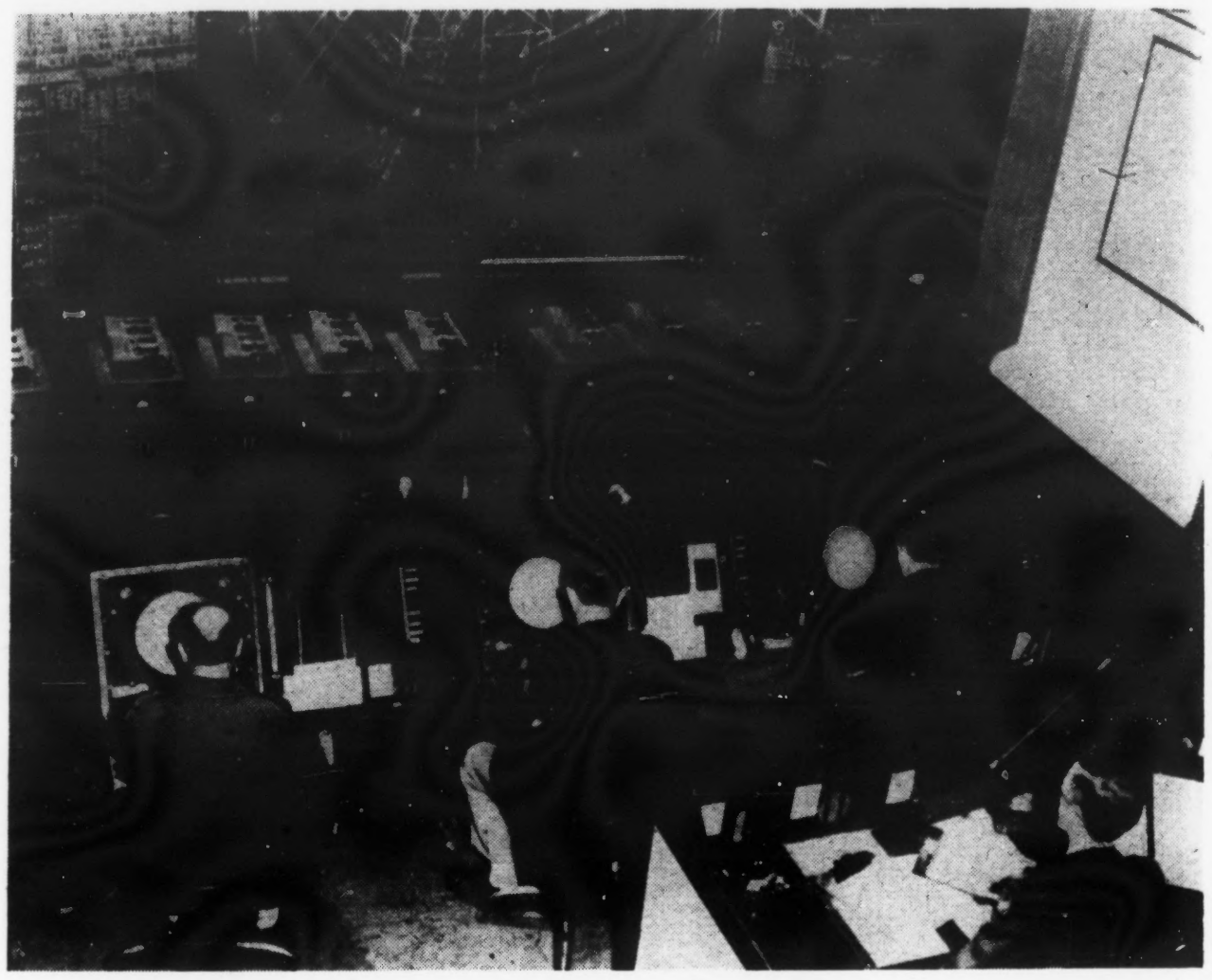
6. Furthermore, since there are no "memory" facilities inherent in a radar operation, it has been found necessary to back-up the radar operation with a conventional progress board which usually requires two more people for the purpose of maintaining the strips current with the immediate operation This is necessary in event there is a radar failure. Hence, a routine operation ends up with a requirement of above eight to ten people, exclusive of supervisory personnel, for each operating "trick" or shift.

7. In the Planned-Track/Vector Control concept, these duties and responsibilities are divided between two or more operators as follows:

a. The operator given the planning duties and responsibilities (PT) conducts his operations on the face of a very large diameter search display tube or similar device capable of providing an enlarged radar display. Using flight data as supplied by such other sources or agencies as necessary, the PT operator locates and positively identifies an aircraft target on the master display.

b. Dependent upon the situation existing at the moment, the PT controller describes on the face of the master scope display, a grease pencil track (or any suitable means of marking) for each aircraft along which he wants the respective aircraft vectored. The identity of the aircraft along with such other flight data as pertains to the respective aircraft are penciled in along the grease pencil track. Note here that for the first time a correlated memory function has been incorporated in the operation.

c. At the vector controller's (VC) position, the operator is presented with an identical display of the master scope, including the various penciled tracks and pertinent notations placed thereon by the PT controller if video mapping techniques are used as exemplified in Figure 1. In lieu of video mapping, a large diameter display tube or projection techniques may be employed. This is illustrated in Figure 2 and appears to be the more desirable of the two methods both from the equipment and operational viewpoints.



Radar air traffic control center—at Andrews Air Force Base near Washington, D. C.

d. The VC operator, therefore, is presented with the complete, predetermined flight situation. *His sole responsibility now consists only of keeping each aircraft on or near its designated track.* This is accomplished through the medium of simple right or left turn instructions (vectoring) as required.

e. Under these conditions, the VC operator is relieved of the identification, planning, and memory duties, retaining only the control responsibility. The PT operator — the actual controller — assumes the identification and planning functions (minus the actual RT control duty) while the correlated memory portion is retained in the tracks and information placed on the screen of the master control scope. It is worthy to note one extremely important feature provided by the tracks that is not enjoyed in current operating methods, and that is the ability of the PT controller to predict the aircraft's exact position at some future time. This is very useful, for considering the situation display in its entirety, he can foresee flight hazards and adjust his tracks accordingly long in advance of the time at which the hazards were to occur, thus maintaining an extremely safe operation.

f. In event of radar failure, the exact position, altitude, heading, and identity of each aircraft are known as of the moment of failure. This "correlated memory" is an invaluable aid to the controller in simplifying considerably the emergency control instructions that must be issued to direct each aircraft to a designated holding point and altitude since all such instructions subsequent to the radar failure must be based on time-distance techniques until at such time each pilot has completely oriented himself and resorted to standard (ANC) instrument flight rules.

g. It is to be noted that if the day ever arises wherein television techniques are employed to relay ground data from a center direct to the pilot of an aircraft, it will be possible to dispense with the VC operator on the ground and give this responsibility to the pilot. Such a scheme envisions the televising of the master scope on which the controller visually points out to the pilot the target produced by his aircraft and then describes the track along which he desires the pilot to proceed. It becomes a matter then of the pilot simply observing his radar target position with respect to the track established by the controller and flying his aircraft so as to maintain it on the designated track. His position with respect to other aircraft is visible to him in addition to the individual visual instructions issued to the other aircraft. Since one television channel can provide information to twenty or more aircraft simultaneously, the present workload imposed on the radiotelephone channels should be reduced materially because RT contacts should be reduced to simple acknowledgements on the part of each pilot for each change in his visual instructions.

h. Figure 3 is illustrative of the type of shorthand instructions that can be placed on the master control scope to simplify this type of operation.

LIGHT

This article consists of Chapter 5 of the recently completed book, "Origin of the Universe and the Secret of Light and Magnetism." It is reproduced here, as other chapters will be in future issues, by permission of the author, Edwin Yates Webb, Jr. We are glad of the opportunity to present this and future excerpts from the book, because we feel that the theories advanced by the author, a departure from currently accepted scientific theories, should be brought to the attention of our readers. Mr. Webb's theories will undoubtedly raise some controversy, and we hope that our readers will give us some expression of their opinions.

Light is customarily accepted to mean only that portion of the spectrum which is seen or detected by the eye. However, strictly speaking, various types of invisible radiations should be included, since in all respects their behavior is similar. These are the ultra-violet and infra-red radiations which are above and below the visible, and still higher, beyond the ultra-violet are the x-rays as well as the so-called cosmic rays. Below the infra-red begin the radiations of the well-known waves of radio transmission. All these radiations have one property in common; equal speed of propagation.

The history of the study of light from the time of the Greeks and the Egyptians has already been related in all their fanciful aspects. Throughout this period there seems to have been only one thought in common to all these men; that a medium of "something" transmitted this light. Since the days of Newton this medium has been called the "luminiferous ether" or just "ether." The fanciful properties and attributes ascribed to this "ether" range from those of "harder than diamond" to "more fluid than air," all of them in a determined effort to explain known phenomena concerning it.

From the days of Pythagoras with his "Octopus Eye" and the theory of Democritus with his "Emanating Objects," to Newton with his "bouncing Corpuscles," I come to this moment of disclosing my own theory of the great mystery of light.

Preparatory to disclosing the precise truth of light and a description of its exact composition, I shall discuss some of the facts and phenomena already known, which have led me to the conception of this truth. The primordial entity filling the infinite realm of space is not an ether, but is a fantastic electric field, hitherto termed the "Arcandeum," God's great secret. This field is at absolute rest and all bodies that move, pass through it. It is this electric field which transmits light. Its characteristics control completely the velocity of the light within it. Light once started in the field, rushes away into space, at a fixed, finite velocity, controlled by the characteristics of the field. To a receiving observer, the light would appear to travel faster or slower, depending on his direction of motion, if the field had a "drag" or a different velocity with respect to the earth. Michelson's classic experiment could find no evidence of such a drag; relativity explains by saying that, due to the motion of the earth, the "measuring rod" changed in length just exactly the amount to mask detection of the change in the velocity of the light being measured. Whether or not the "measuring rod" shrinks, I see no logical, physical, sensible or natural reason why this field should be in a state of motion in space for any cause whatsoever, since, if for no other reason, as already said, there is no place for it to go as it already extends to infinity.

Relativity states that, since it is beyond the power of man to detect his motion through the "ether" by experiments with light, it is impossible to synchronize clocks (time) at any two points separated on the earth. As an example, an observer in Washington transmits a radio pulse at exactly noon. An observer in San Francisco wishes to synchronize with the Washington clock by means of this pulse. He allows for the time of travel of the pulse from Washington to San Francisco. However, assuming that at that period the orbital motion of the earth is such as to cause San Francisco to advance toward Washington the observer must also allow for the decreased distance that the pulse must travel, since, actually, the wave or pulse does not travel the entire distance between Washington and San Francisco. In the case of a pulse sent from San Francisco to Washington, the reverse effect results, due to Washington's moving away from San Francisco so that the radio pulse will travel a little farther than the distance between the cities. Relativity postulates that, since we do not know our velocity with respect to the "ether," it is forever impossible to calculate the time of travel of the pulse between these two points.

In the first place, this electric field connecting these two points is not moving—it is at absolute rest and, as a result of this, the equation for the time of travel of a radio wave between any two points on the earth, must be:

$$T=\frac{K}{C^2+U^2}(C-U^2+U^2\cos\theta)^{\frac{1}{2}}+U\cos\theta$$

Where C is the velocity of light,
U is the orbital velocity of the earth, which is about 19 miles per second.
θ is the angle between the points, with respect to the direction of the earth's orbital motion and
K is the distance between the points.

If the points are in a straight line with respect to the orbital motion of the earth, then

$$T=\frac{K}{C\pm U}$$

If they are 90 degrees (right angles) with respect to each other,

$$T=\frac{K}{YC^2-U^2}$$

In the second place, even if this electric field were moving, i.e., not at absolute rest, we could still measure our velocity through it in a simple manner. We select two identical land-line circuits between San Francisco and Washington. These circuits are then connected together at San Francisco, and Washington sends a pulse on one and measures the time it takes for it to return on the other. On identical circuits, then, the travel time to San Francisco will be exactly half of this. However, to insure that the lines are identical, Washington will send a pulse to San Francisco on both circuits simultaneously and then San Francisco will adjust electrical components in one circuit to make the arrival of the pulses on the two circuits exactly simultaneous to him. Then when these two circuits are connected together at San Francisco, and Washington sends a pulse on one and receives it on the other, then one half of this time is the exact travel time of the land-line pulse between Washington and San Francisco, for Washington has made the measurement without the uncertainty of the position of San Francisco and no "ether" has been involved.

Let us assume that the travel time to San Francisco and return, measured at Washington, is exactly one second. Then, the travel time of the pulse from Washington to San Francisco is one half of this, or one half second. Therefore, if Washington sends a time signal on the land-line circuit at exactly noon at Washington, San Francisco must add one half second to his clock when the pulse is received from Washington.

Now, let us go further—the pulse is sent on the land-line at Washington; it is simultaneously sent by radio. San Francisco then receives two pulses, one from the radio channel, one from the land-line channel and he finds that the radio pulse arrived exactly .485 second before the land-line pulse. Knowing already that .5 second was required for this land-line pulse to reach him, he determines that the difference or .015 second was the exact travel time of the radio pulse. San Francisco would then add .015 second to his noon time. Then, this is the same time T which should be derived from the foregoing equation. Any difference, if there were any, could be attributable to the earth's "drag" in the "ether."

These experiments as described are elongated versions of Michelson's work, *but* without his mistakes, and with the exception that no effects of shortening or lengthening of "measuring rods" can influence the results, as such erroneous possibilities are overcome completely. An additional check could be made by repeating the Washington-San Francisco experiment by having San Francisco do the sending, and then determine if

YATES, I CANNOT UNDERSTAND YOUR THEORIES: THEY ARE TOO SIMPLE FOR ME.
PROFESSOR, THAT'S EXACTLY THE WAY I WANTED THEM, FOR THE WAYS OF NATURE ARE SIMPLE. IT IS MAN WHO HAS COMPLICATED THEM
ALBERT, PUT THAT IN YOUR PIPE AND SMOKE IT!
ORIGIN OF THE UNIVERSE AND THE SECRET OF LIGHT
E.Y. WEBB
E. WEBB
EINSTEIN
GRAVITATION
RELATIVITY
QUANTUM
NEWTON
PHYSICS
ELECTRICITY
GROWING MADE SIMPLE
TO MY ESTEEMED FRIEND — EDWIN YATES WEBB JR., A WORTHY SON OF A WORTHY FRIEND OF
THE EVENING STAR WASHINGTON D.C. JULY 30

there were any difference in the time of arrival of the pulses. In both experiments the "measuring rod" phenomenon has been eliminated.

"Li-cond"

The reason the velocity of light and radio waves seems so great to the human mind is that, due to custom, we have taken the *second* as our unit of time. If we had taken the *hour* as the unit, this velocity would have been still greater. Nature has not used this unit —she has used no unit at all; it is only man who has done it. If we had used something like a "Li-cond," or light second, which was equal to 1/186,000 of our clock second, then the velocity of light would have been "one mile per Li-cond." The same is true of *frequency*. Instead of a "million cycles per second," we would have about "five cycles per Li-cond." However, due to the limited range of our senses, it was inevitable that we should select a time unit whose length and effect we could understand and detect.

In explaining the well-known experiment of the interference fringes of light produced on a screen, the Corpuscular theory explains by declaring that a single photon (or electron) passes through both holes simultaneously. This is utterly absurd and I refuse to consider it. I have a more exalted opinion of nature than to believe that she resorts to such magical trickery. This alone should make anyone search further for a more intelligent solution.

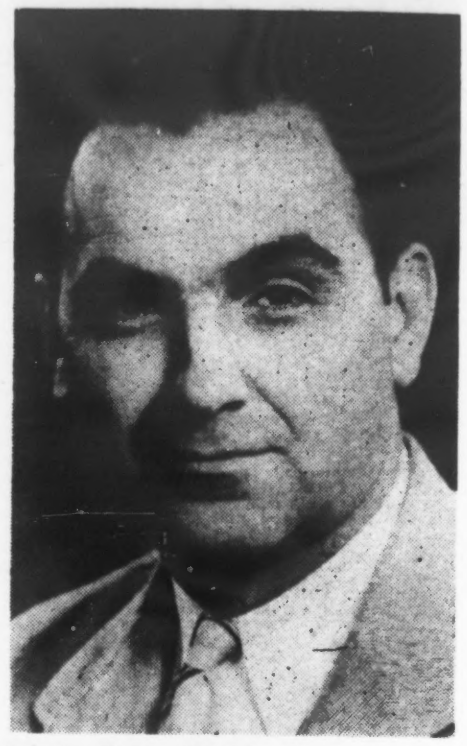
There are other present-day quantum statements which are just as incredible. I quote from a recent book describing the Theory of the quantum, page (157): "How would we feel *to be told* that an electron can be in two places at once, or can be going in two directions at the same time, and more than two? Something closely akin to this must now be swallowed!" I find a marginal note in the book beside this statement which describes my reaction to it: "If I were told this, I'd say the *teller* was a nut. Figures may not lie, but liars can figure." On page 161, I find another interesting statement to the effect, that "In the *language* of the new physics, we would say that the state of a spinning coin is a combination of heads and tails." Here a marginal note brings a smile, to wit, "Such language would be utterly asinine." Following this I read, "Since a long series of observations would show that the spinning coins came down heads about as frequently as it came down tails, we would say that in the combination state, the coin had a fifty per cent probability of being in the tail position and a fifty per cent probability of being in the heads position. As soon as the coin came to rest on the table, of course, we would know quite definitely which it was: either heads or tails. The state would be changed from a combination to a pure state, and it would be changed by the the act of observation; all of which we could express in mathematical sign language." Here I find another interesting note which describes my unbelieving reaction, "My New York friend is expecting my arrival from Washington. I can travel via B. & O. or Pennsylvania. Therefore, my friend in New York does not know which "state" I am in until he 'jolts' me (by observation) so I am in a *combination* state and am on the B. & O. and the Penn. at the same time! Horrors! He recalls that I can travel by bus—or perhaps fly—or even skate! Then he faints. Upon being "jolted" on my ar-

rival, I collect myself from the combination state, put my pieces together and visit my New York friend in the Psychopathic Ward."

On page 174, we find the statement, "experiments are a clumsy instrument" but, on page 178 we find, "the exquisite mathematical laws which have so eminently proved themselves in the acid test of experiment." Then, on page 191, my disgust is complete when I read, "Experiment, that final arbiter of Science"—. But what has happened to its clumsiness, etc? It sounds like double talk to me! So go some of the tenets of the quantum mechanics, whose corpuscular theory is supposed to explain the great secret of light.

Such a state of confusion is enough to make anyone question the validity of the classical experiments on light and the theories concerning it. The truth of this shall soon unfold.

Edwin Yates Webb, Jr., the author of "Origin of the Universe and the Secret of Light and Magnetism," from which book this article is an excerpt, entered government service during World War II, after 17 years with the Bell System in Atlanta, and is presently chief of research and development, Signal Corps Intelligence Agency. An ardent "ham" since he was a youngster in Shelby, North Carolina, he credits his boyhood amateur radio activities for the stirring of his early interest in the wonders of light and magnetism. And later, it was radio that renewed that curiosity, by way of a query of his father's. Looking at a transmitter tower one day, his father asked, "What is it that connects that transmitting tower with my receiving antenna, and what travels between them?" Unable to give what he could consider an adequate answer, the junior Webb never forgot the question. What had been curiosity developed into a burning thirst for what he felt would be the truth concerning the "electric field," and years later, finally satisfied that he had arrived at the truth, he set down his theories and published them in the book from which is published here the chapter on "Light."



Edwin Yates Webb Jr.

The Truth of Light

Two thousand years have passed since the Greek and Egyptian philosophers sought to fathom the secret of light. Two hundred years have passed since Newton gave us his corpuscular theory to explain it. Now, may the spirit of these great men be with me, as I disclose what I feel is the truth of light and the real answer to this ancient mystery, nature's deepest secret:

Light Is a Rapid Change in Voltage in an Electric Field

Yes, a change in voltage in the arcandeum, the colossus of space. When the change is at the slower rates, radio waves result; when the change is at higher rates, heat waves, light waves and x-rays result. What could be more simple?

It is the arcandeum, the electric field, which exists throughout space. Electric waves are merely changes in the potential of this field, and as this rate of change increases from zero, the waves of the well known electromagnetic spectrum result. When the voltage is increased or decreased between any two points in the field, the resultant change in the field at the points affect adjacent points, and this change affects still adjacent points, increasing or decreasing the voltage across successive points. This results in a continuously expanding change in the region around the original point, which moves outward with a velocity controlled exactly by the properties of the electric field, itself. Light, then, is the change in this voltage at a rate to which the receiving device of the eye will respond. Light is a moving voltage and nothing more.

On the basis of this real and simple explanation for the mystery of light, many of its grotesque phantasmagoria reduce to friendly and intelligent form. The action of a radio wave becomes quite understandable, for instead of the moving wave generating or creating a voltage on the receiving antenna, the wave itself becomes the voltage. The electric field is already existing at the antenna. The on-coming wave is merely a change in it and the effect of this change is detected and translated by the radio receiver.

With this simple understanding of the nature of light, more of its phenomena becomes clearly understood. The eye now becomes a group of antennae, each tuned to respond to a voltage of certain frequency. The voltages reaching these antennae are then transmitted to the retina of the eye, thence to the optic nerve and then to the brain, which reproduces the voltages into impulses of sensations recognized as sight. Due to the action of the lens, the retina, being spherical, receives these voltages at different distances from the connecting optic nerve. The optic nerve is merely a system of "wires" carrying these voltages from the antennae of the eye to the brain. The resulting voltages from the retina then reach the optic nerve at different times, and the degree of this time difference is controlled by the distance of the visible object from the lens of the eye. From this difference in time we receive our impressions of *distance*.

Since light is merely a change in voltage in an electric field, *color* is the result of the rate of this change, and all these vibrations or changes in voltage are transmitted with exactly equal velocities. It is clear that no separate, individual waves exist for each of the "colors," only one single voltage-wave being produced as white light. However, this single wave is varying in frequency from the red at about 400 trillion changes per second to about 700 trillion changes per second for the violet. In other words, the rate of oscillation of the atom producing white light is changing from 400 trillion to 700 trillion per second. As will be explained later, this results in the voltage wave appearing to be in "spurts," since first the red frequency is generated by the ocsillating atom, thence through the spectrum to the violet, etc. Therefore, while the red frequency is being generated, there is no violet, and vice versa. This explains why light has appeared to come in "spurts," and shows that it is not "packets" or particles or corpuscles or "quanta."

The rate of change of the voltage-wave of light is caused by movement or oscillation of the atom generating it. By this means, nature has created an ingenious system of remote control, wherein an oscillating atom at a source of light excites the electric field and the resulting "wave" in the field excites the atoms of matter at great distances from the source. Therefore, the voltage-wave of light impinging upon the atoms of any matter at *any* point have the voltage of the wave delivered to them. If then, the atoms have *natural periods* in the range of the frequency of the impinging voltage, they too, will oscillate freely. The condition of the atoms determines its freedom to oscillate and this is controlled by its size and the other forces surrounding it. In the so-called transparent mediums, the atoms are free to oscillate at light-wave frequencies and thereby re-transmit or re-create the exciting or impinging wave. It is in this manner, as previously explained, that "light" "passes through" glass and other materials. If the atoms of the material vibrate in only the plane of the impinging light, then re-transmission is in the forward direction only and there is no dispersion; i.e. no lateral wave is produced. However, if the atom vibrates in two or more planes, lateral voltages result, allowing light, in varying amounts, to be seen at angles to the impinging rays. This is the condition of water. Since every atom has some degree of freedom to oscillate in more than one plane, an impinging wave exciting it will produce some lateral effect and, therefore, has some degree of dispersion. However, there is no dispersion of light travelling in the electric field when it is in its true, homogeneous state.

When excitation begins on a quiescent atom, it first oscillates slowly—and if it is not agitated more violently, only the low-frequency wave which we per-

ceive as heat is given off. If the agitation is made more violent, the atom is made to vibrate faster, producing the higher frequencies in the electric field which we perceive as light. This explains why, in the exciting of the atoms of most of the elements, "heat" is first emitted and then light, and why light is almost always accompanied by heat.

Effect of Heat and Light

Following this same remote-control effect, the rate of change of the waves of Sun-light control the frequency of the oscillation of the atoms of the tissues of the body. The rate at which these atoms are caused to oscillate determines the effect produced upon the tissues. It is in this manner that "vitamins" are produced by sun-light, as well as sun-burn and heat. However, heat and light do not exist when the voltage-wave is moving in the electric field alone. The wave must strike *Mass*, that is an atom, before heat is produced and must fall upon some form of eye before light is produced.

A most important consideration of this marvelous remote-control system which nature has built is the therapeutic effects that are possible, for it becomes evident that the electrical activity of the cells of the living tissues can be controlled, increased, decreased or revived by applying an electromagnetic voltage of specific magnitude and specific frequency to them. Here lies a vast field for therapeutic exploration, in the application of voltage fields and magnetic fields to the cells forming life. Tissues, cells, seeds and even the atoms of inanimate matter are influenced or improved by these fields. The effect of heat and light on tissues and cells is well known; the effect of heat in the treatment of metals is also well known. However, the tremendous possibilities have never been completely explored, and great opportunities are awaiting here.

I have long felt that the Diseases of Cancer and Poliomyelitis are not caused by a germ or virus. Nature has provided many types of germs and organisms that attack and destroy life, but here, in these diseases, lies internal disintegration of the tissue cell itself.

In Cancer, the electrical phenomena in the cell are disrupted by some external force. If the electrical processes continue after control is lost, a tumor results, as growth exists without control. If the electrical processes cease, the cells die, and cancer results, for in the decaying or dying process, additional surrounding cells are destroyed by those already decayed. These dead cells can stop completely the electrical processes in any other tissue cells that they might contact. This is why cancer in one part of the body can begin anew at another part. The dead tissue cells are not recognized as foreign organisms or germs by the corpuscles of the blood and therefore are not attacked by them. Therefore, these dead cells can pass into the blood and attack a weak part of the body, reappearing there as a new cancer.

Poliomyelitis is another disease of electrical origin. The nerves of the body are merely the "wires" of an electrical network carrying the voltages, or electrical impulses, which control the muscles. When one of these nerves or "wires" ceases to function as an electrical conductor, control of the muscle is lost. From disuse the muscle then decays or withers away, or atrophies. Some foreign influence has acted to disrupt the electrical functioning of the nerves.

In both of these diseases, proper external application of high frequency voltages, controlled in frequency and magnitude, should be tremendously effective in alleviating and curing their effects.

It is now clear that light does not consist of "particles" or "corpuscles" or "photons." In reality, it is no essence at all, being merely an increase in density of an electric field, quite similar to a sound wave being an increase in density of the air.

As long as the field is continuous and homogeneous in density, there is no unbalanced force in it and hence, no influence to drive or create a "wave" or disturbance to travel in any direction.

Therefore, adjacent points in the field are at the same "potential" and no unbalanced force exists. However, if the density of the field is increased in *any degree*, a potential or unbalanced force arises at the point of increased density, and this force or potential, in attempting to become re-equalized, is carried away in all directions into the field; the field now unbalanced, attempts to return to its original homogeneous state. This "wave" or increased density of the field has *exactly* the same "force" acting upon it as does a water wave, or sound wave:

It now has weight, with respect to the yet undisturbed field around it. It has excess charge which makes the surrounding field at a lower potential causing the excess potential to tend to equalize by "moving" in it. The water wave has excess "weight," being more than the medium around it, and moves outward from the origin in attempting to become equalized. Due to friction in water, the wave may dissipate. However in the arcandeum, the electric field, *There is no friction*, so light waves are never dissipated as long as they move in the field in its homogeneous state; that is, unless is becomes dissipated by "friction" in the atoms of some form of matter.

Now that the light wave has a density greater than the field that surrounds it, *it is a form of matter* in a temporary or transient state. It is acted upon by "Gravitational" fields and therefore appears to have "weight." This is the reason why light "bends" or curves in the neighborhood of a gravitating mass such as the sun. Since the wave has temporary mass or effective mass as long as it is moving, it can create pressure upon "permanent" mass when impinging upon it. When light is interrupted in its motion transient mass disappears when its charge is absorbed by the interfering object. Here is how light "meets an ignoble end on my floor"—no "corpuscles" being involved in the process. This is a form of atomic disintegration. If this temporary or transient mass were made permanent, the creation of matter would result. atomic fission, being the reverse process, is merely the returning of a "permanently" dense charge to its original homogeneous state in the electric field.

Other Phenomena Explained

Many other phenomena now lose their mystery. Our well-known Northern Lights are merely voltages, or corona discharges into the atom of the air, generated by the movement of the earth (a conductor) in the electric field. Earth charges (usually called "currents") are generated by them which produce a magnetic field around the earth; hence our north and south magnectic poles. If the earth changed its motion from west-east to north-south, its magnetic poles would change, in accordance with Lentz's Law— rather, nature's law stated by Lentz.

The behavior of light through certain crystals (polarization, due to beam, etc.) is due to the manner in which the atoms of the crystals oscillate under the influence of the impinging light. In other words, the crystals regenerate or recreate the incident light, and the degree of freedom of its atoms to oscillate determine the type of light that is passed on.

X-rays do not pass through an object such as human flesh. These "rays" are oscillations in the electric field at a very rapid rate, and when these high-frequency oscillations are directed upon the atoms of human tissues (or any other atoms), these atoms merely re-oscillate atom affecting the adjacent ones, thereby transmitting the incident "ray" into and through the tissue, causing it to fluoresce; i.e. generate its own "light," which then causes an exposure on the photograph plate. Nothing whatsoever passes through the object except an effect.

It is now quite evident, of course, that the arcandeum itself, is the electric field in its most homogeneous, or least dense, state. This is the field in its most "elastic" form and as a result, it is the condition that will transmit a disturbance or wave in it at maximum velocity. This velocity is known to be approximately 186,000 miles per second. Any other condition, or any change in this field, whatsoever, will cause a *reduction* in the speed of transmission of the waves. In other words, the field alone (a vacuum) will transmit light

at its maximum velocity. Any other condition of the field such as transparent matter will always cause a reduction in its normal velocity.

When a voltage is created by light (or other source) in the field, the radiation, of necessity, must be in a sphere, unless obstructed, since the velocity of its transmission is the same in all directions. In the classical pin-hole interference experiment, the reason the pin-holes become point-sources of light is quite obvious. The circular lines drawn emanating from the source of light are merely points of equal potential in the electric field. When this "wave" or voltage passes through a small hole, a small section of the wave is separated from the on-coming equi-potential wave, by the walls of the pin-hole material. After the voltage has passed through the holes, the "edges" have been "cut" and therefore, these edges are unbalanced, or are at a higher potential than the adjoining field, creating an unbalanced voltage in what was formerly a line of equi-potential voltage. The result is, of course, that the pressure, or excess voltage begins to spread (with the same velocity as the impinging wave) perpendicular to the line of motion of the impinging wave in the hole. This makes all radii of the radiation from the pin-holes equal, which of course, forms a sphere.

Reflection

These small sections of the impinging voltage wave, selected or separated by the holes now represent an unbalanced voltage and therefore, will cause fluoresing or scintillation on a cathode screen, even though the incident light itself might be in the invisible infra-red or ultra-violet range. These small impinging waves now represent spherically unbalanced voltage and merely produce sufficient temporary agitation or "heat" in the metallic particles of the fluorescent screen to cause them to fluoresce at a visible frequency by "burning" the material from which the screen is made. This causes the atoms of the particles to oscillate in the visible range. Here, then, is the very real reason why, in the classic pin-hole experiment, the wave motion of light produces the well-known interference fringes, as well as scintillations on a fluorescent screen, no wave-theory being required to explain one effect and a corpuscular theory to explain another—no reason why a "photon" should pass through both holes simultaneously—and no reason why an electron should be both a particle and a wave—not even a particle guided by a wave!!!

At every point in an illuminated room, there is an infinite number of images of every object in the room. There is complete chaos of light. It is only through the action of a lens or small hole that a single image is selected from all the others. Because of this, — no single image of an object is cast on a wall or screen—there are an infinite number, until a small aperture selects one or a few, of them. It is because of this that the "pin-holes" are necessary in the light-interference experiment. By increasing the intensity of the interference patterns the experiment could be considerably improved by placing the two pin-holes in a mirror screen instead of an opaque medium.

Since light and other electromagnetic waves are themselves charges in motion, numerous interesting optical experiments for detecting and measuring this voltage, are possible. As a continuation of the pin-hole interference experiment a series of concentric circles around a center, etched into metallized glass could be arranged so as to connect alternate circular conductors to add their voltages in phase with one another, thereby developing a measurable charge across two resulting terminals. The same effect could be produced by connecting alternate metallic lines spaced a distance approaching the wave length of heat or light.

Color A Condition of Atoms

Transparent mediums are poor reflectors of light as the degree of freedom of their atoms permits most of the impinging voltage of the wave to be regenerated in the direction of the light transmission. However, in metals and certain other materials, only the surface atoms are free to oscillate as their forces are balanced on one side only. Therefore, light impinging upon a polished metal surface causes only the outside layer of atoms to oscillate, thereby causing them to fluoresce and become the momentary or temporary source of light, resulting in apparent reflection of the light.

Reflection is the exact phenomenon of transmission. As just explained, a wall or any object reflects light because its surface atoms can vibrate under the influence of the incident light, thereby regenerating the light which then radiates in all directions. In effect, then, an illuminated object is "glowing" under the influence of the impinging light. The "smoother" the surface the more its surface atoms approach a single layer, thereby regenerating or reflecting all points of an impinging wave in more exact time-phase. A rough surface with several different layers of atoms exposed reflects a great number of images of an object in different directions, due to the irregular surface, causing a blurred, unrecognizable image to be received by the eye, leaving only the total light from the rough surface to be recognized. Therefore no single, recognizable image is reflected. If the surface is made smoother approaching the polished surface of a mirror, the number of regenerated images that are not in time-phase is reduced, allowing the eye to select *one* of the reflected images of the object, instead of seeing the several from the various layers of atoms of the rough or multi layer surface.

Interference Fringes

Color of an object is a result of the atoms of the object vibrating more freely at one frequency than at others. An object appearing violet merely has the forces of its atoms so controlled that the atoms vibrate or re-generate only at the higher-frequency rate which affects the high-frequency antennae of the eye generating high-frequency impulses which are reproduced by the eye as violet. Of course, the same process produces the other "colors" of the spectrum. The atoms of certain elements vibrate closely at a single frequency to produce a single "color." The atoms of other elements or mixture of atoms, oscillate at frequencies which sweep across the entire visible spectrum, producing all "colors," resulting in emission of "white" light, which, of course, is the combination of all "frequencies" which the eye detects as white light. It is evident, therefore, that nowhere in nature—nowhere in the universe—is there such an essence as color. In reality, there is no color. No "color" actually exists, for it is in reality, a state or condition and not an entity in itself. Color is a condition of the atoms of matter, which, as explained, results from their ability to oscillate more freely at certain frequencies, thereby regenerating or reflecting the lower frequencies, which are perceived by the brain as "red." Actually, however, there is no "red" material in a red object. A "white" object, then, is one whose atoms are free to oscillate and regenerate at all frequencies of the visible spectrum. Sunlight is known to "bleach" or "fade" certain materials. However, if any material has "color" it means, merely, that its atoms oscillate more freely at the frequency corresponding to it. Under influence of sunlight and other "rays," these atoms previously restricted, are agitated until they are able to oscillate at other frequencies, always approaching the freest vibration of that of "white." Nothing ever "fades" from purple (high) to red (low). It would always be from red to purple to white.

The phenomena of the photoelectric effect are well known and some seem difficult to explain. The following experiment is a typical example of attempts to observe and explain some of these phenomena. "A box containing a gas has two metal electrodes in it and a battery across the electrodes, creating an electric field between them, but no current flows.

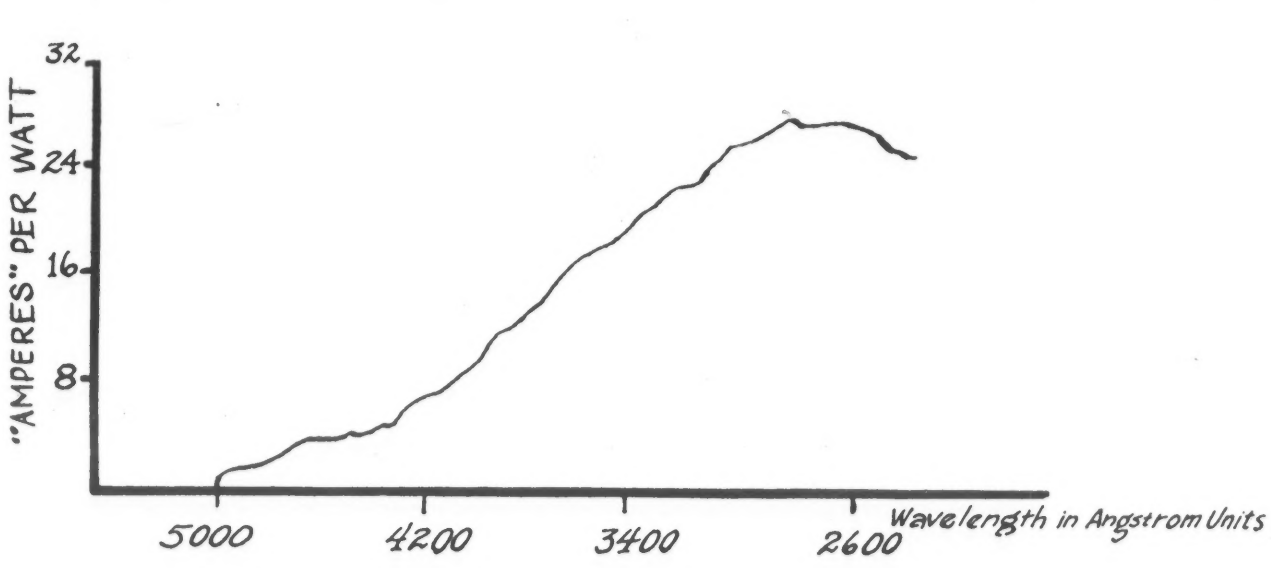
When x-rays are passed through a "metal window" in the box and between the plates a "current is readily detected" as passing between the plates, due to the "photoelectrons," and positive ions, formed from the atoms which have

lost electrons, are swept by the electric field to the electrodes, and a current flows."

In the first place, the x-rays are not *particles*: they are merely high-frequency voltages moving in an electric field. They do not *go through* the aluminum window—only make its atoms oscillate and re-generate at the x-ray frequencies. When these high-frequency voltages strike the atoms of the gas, they make them *vibrate violently,* i.e. elongate, and at right angles to the "rays," which then, is perpendicular to the plane of the plates. This elongation creates a *chain of atoms* between the plates, and these atoms are minute charges which add to become a potential difference across or between the plates, making this space become a conductor. In this condition the gas is now, like any other 'conducting metallic-element, as most of its atoms are aligned in one direction, whereby a "circuit" is produced. The gas atoms do not *absorb* any x-ray "particles" or "photo-electrons"—for there are none. The voltage of the incident ray is simply transferred to the oscillating atoms! This same effect should be produced by *heating* the gas with a beam of "heat." However, the effect will be much smaller since the voltage across each atom will be smaller as its rate of vibration will be slower, due to its lower frequency of the exciting wave. This, of course, makes its "elongation" less and the "circuit" have higher "resistance."

It has been found that if monochromatic radiation is incident upon the surface of a metal, it is said that "the photoelectric yield, i.e. the number of "electrons" emitted (for each "quantum' 'absorbed) is zero, when the wavelength of the incident radiation is longer than the threshold wavelength. As the wavelength of the incident radiation is made less than the threshold wavelength, emission begins and the photoelectric yield increases with increase in frequency for which the yield is maximum, and for higher frequencies than this, the yield decreases."

The following curve illustrates this behavior for the metal barium:



Quantum Mechanics gives this explanation:

"For wave lengths slightly less than the threshold wavelength, only the vibrations which have the greatest kinetic energy inside the metal will be able to escape after absorption of "quanta." As the exciting wavelength is made shorter, the energy (h v) of the "quanta" increases and a greater fraction of the electrons which have absorbed quanta will be able to escape."

"The existence of a maximum in the yield curve is not so immediately understandable. It results from the fact that the probability of absorption of a quantum by an electron decreases rapidly with increase of the frequency (decrease in wavelength). The maximum in the photoelectric yield curve is then the result of a superposition of two effects. The shorter the wavelength of the radiation, the greater is the fraction of the electrons which will escape from the metal after the act of absorption, but the shorter the wavelength, the smaller is the probability that any individual electron will absorb quantum. For wavelengths less than that which corresponds to the maximum in the yield curve, the second effect is more important than the first."—!!! (Whatever that means!)

I say this effect can be much more easily explained and without the use of quanta. The incident x-rays are merely high-frequency waves, composed of moving electric charges. Upon striking an atom, which is also a (stationary) electric charge, the atom is made to oscillate or vibrate. Maximum vibration or intensity of movement of the atom will occur at the *natural period* of the atom, which is controlled by its size and the forces which hold it. If the incident frequency is that of the natural period of the atom, the entire voltage of the incident ray will be delivered to the atom, giving it maximum swing or oscillation, as well as maximum voltage. The foregoing curve is, therefore, merely one of resonance.

The photoelectric effect of contaminated metal surfaces is well known. A surface which is widely used is the calcium-on-silver oxide. Its yield is very high but the reason for its action is said to be unknown. Its threshold is in the infra-red near 12,000 angstroms and its yield continues to the near ultraviolet region.

The explanation for this seems obvious. The atoms of the calcium-on-silver oxide are not tightly bound; that is, the voltages are unbalanced on the "outside surface" since these surface atoms have only voltages influencing them from the atoms beneath them. This gives them an unbalanced voltage. They are free to vibrate or oscillate readily and violently. Therefore, with incident voltage-waves of frequencies from the low infra-red to the near ultraviolet, they oscillate readily and the additional voltage delivered to them by the incident wave is sufficient to cause them to "push away" from adjacent atoms, or be attracted by the collector plate of the photocell.

Light and Photography

The formation of latent images in photograph emulsions is said to be "the result" of the production of photoelectrons in the interior of the small crystals of the silver halide which are dispersed throughout the gelatine of the emulsion. The "photoelectrons" are trapped at specks of silver sulphide which are present as impurities in the surface of the crystals. The silver halide has a small number of positively charged silver ions wandering throughout the interstices of the crystal lattice and these are attracted to the trapped electrons. The electrons and silver ions unite to form silver atoms. Submicroscopic lumps of silver atoms form the latent image which makes the silver salt susceptible to development by proper chemical reagents"!!! I say such an abstract explanation is neither necessary nor correct. Light, being an increase in voltage in an electric field, produces a voltage across the minute particle of silver on the photographic plate. This voltage produces a "current" in the grains or particles of the silver. This produces heat, causing the grains to "burn" an image in the halide, changing it chemically, which makes it dark in varying degrees when "developed" in proper reagents. The more intense the light or the longer the exposure, the greater is the current in the silver grains and the more is the burning, giving a dark "exposure" on these grains.

In view of this, the size of the grains should be made to have a direct relationship to the wavelength of light. In order to photograph the entire visible spectrum, the emulsion should contain varying sizes of grains, from large, for response to the lower-frequency red, to small, for the higher frequency violet. Infra-red films for low frequencies should contain large grains only.

A curve, similar to the preceding one showing the relationship between photographic yield and impinging frequency for barium, if made for the silver film emulsions, should show similar and useful results. In such a "frequency run" or resonance curve, the grain size for maximum sensitivity can be determined for any portion of the visible or invisible spectrum.

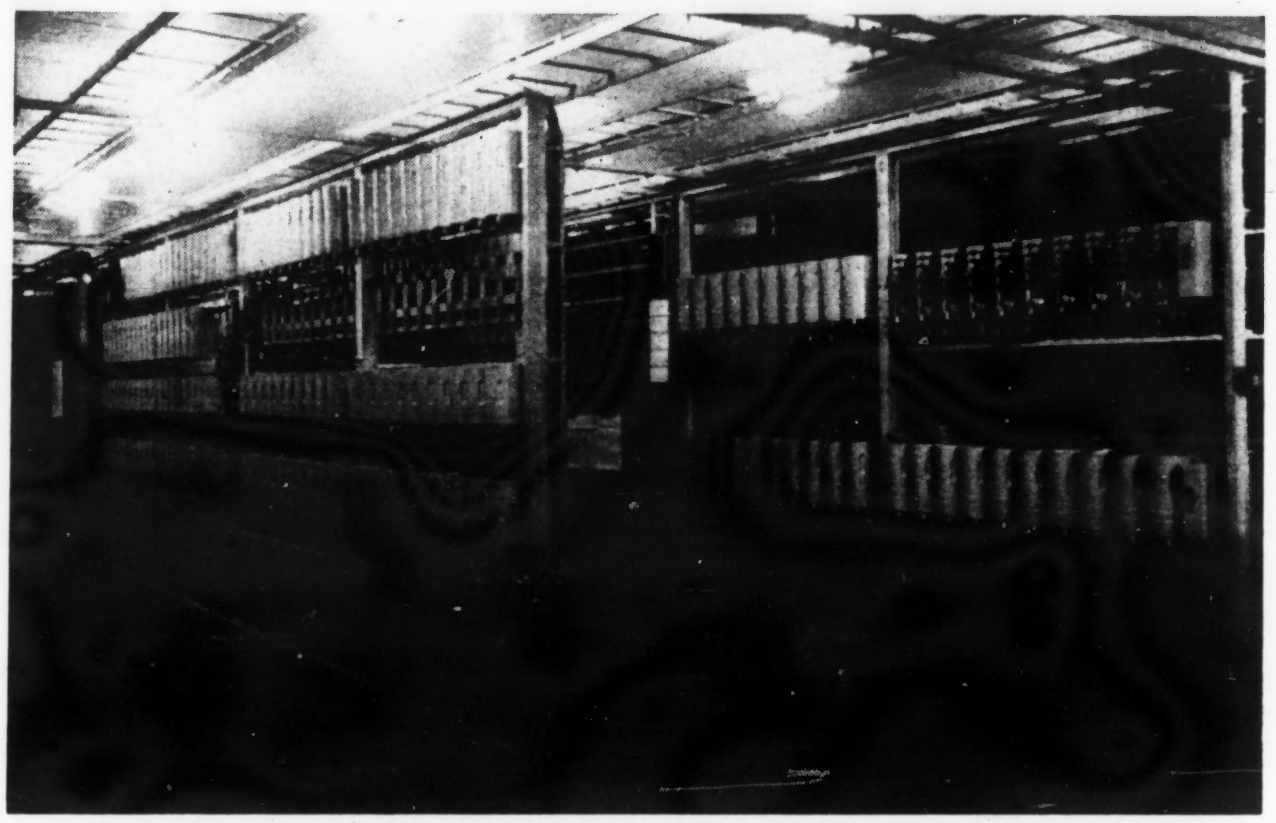
AUTOMATIC ELECTRIC and the ARMED SERVICES

In these days of high speed communication, when automatic telephones are accepted everywhere as commonplace tools of business and living—and of national defense, there is an easy disposition to skip over the nearly sixty years of unceasing technical and commercial development that have brought automatic telephony to its present high order of technological excellence.

In this field, Automatic Electric Company, Chicago, holds a unique position. As the originator of the automatic telephony and leading exponent of the Strowger Automatic, or step-by-step system, it is the only manufacturer of such equipment which has had continuity of organization, for research, engineering and production, since the first automatic telephones were installed in 1892.

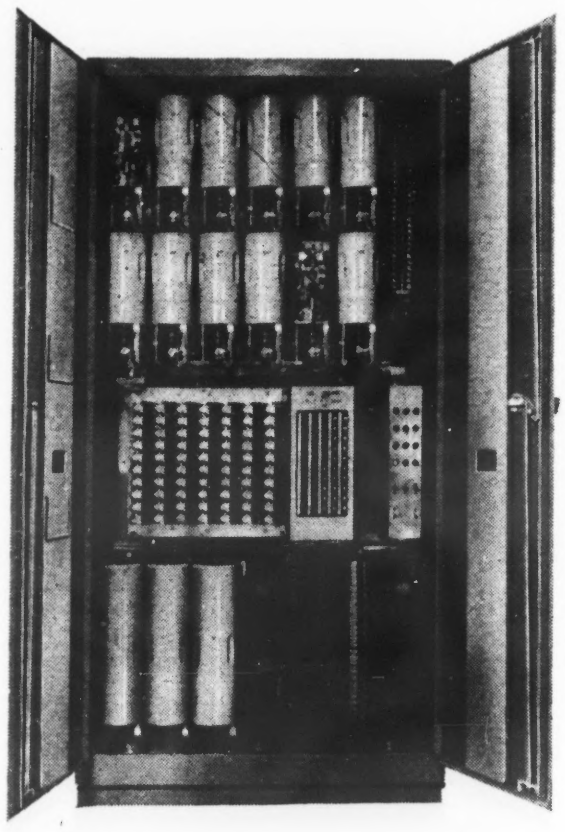
Strowger Adaptability

In a very large measure, the history of Automatic Electric and the history of automatic telephony are synonymous, for during the 25 years which followed its first installation, the Company carried almost the entire burden of automatic telephone development through the pioneer stages to the stage of commercial acceptance and widespread use. It was during these early years that the Strowger system not only gained a firm foothold among the Independent telephone companies in the United States, but also found favor among telephone companies and administrations in many countries abroad. Today the Strowger system forms the basis of nearly three-fourths of all automatic telephones in service throughout the world, including a large proportion of those operated by the Bell and Independent companies in the United States and Canada, and most of the telephone organizations in other countries.



This Strowger Automatic central office switchboard is typical of the scores of installations now serving the armed forces at posts in the United States and abroad.

A typical Strowger automatic telephone switchboard as designed for ships of the U. S. Navy.

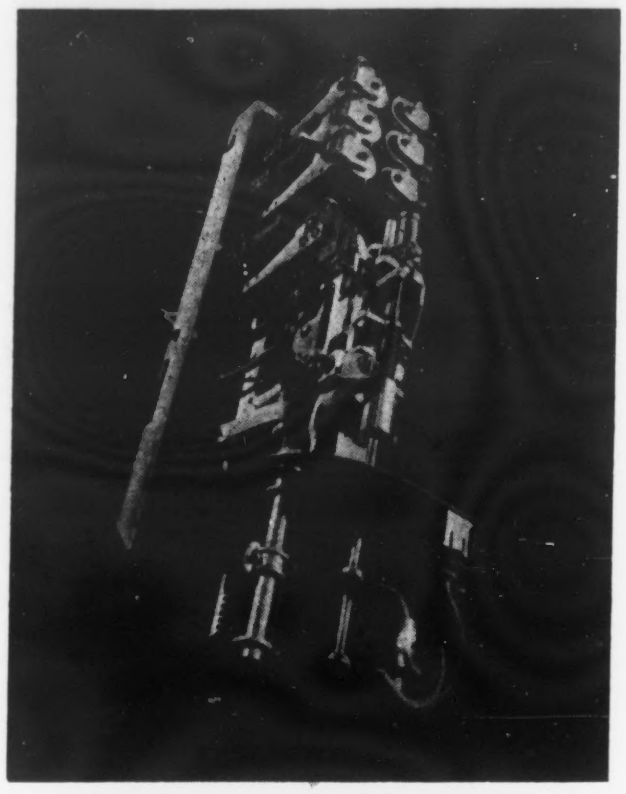


This growth in the use of the Company's basic equipment is due to many things, not the least of which is the simple and easily understood principles on which it is based, and its use of small and highly standardized switching units which may be combined in any desired grouping to meet the needs of a particular installation, whether that installation is to serve a public telephone company, an industrial plant, an air field, or a battleship.

In a Strowger exchange, the total number of telephone lines is divided and subdivided on a decimal basis, and as the successive figures of the called number are dialed, selection of the called line takes place through a progressive narrowing of the field of choice by groups and sub-groups, until the called line itself is finally reached.

The basic unit employed in this process of selection is the standard two-motion Strowger switch familiar to all telephone men. While this mechanism is highly standardized in principle, it is also flexible in its application, and may take any one of hundreds of forms, including various types of line finders, selectors and connectors, each of these classes being available in a wide range of modifications to meet the exact conditions of any particular exchange. It is this combination of standardization and flexibility which makes the Strowger system so readily adaptable to both small and large exchanges, and which with the aid of "jack and plug" switch mounting permits it to be readily changed or expanded to meet growth in traffic or line capacity.

It is not surprising that the qualities of speed, dependability and impersonality of this equipment early attracted



This connector is one of the scores of variants of the highly standardized in principle, flexible in application, Strowger switch.

the attention of the armed services. Its use for military purposes dates back almost to the beginning of Automatic Electric's history. One of the earliest applications was an installation supplied for use as an administrative facility at Fort Sheridan, Illinois, in 1893. Beginning in the early 1900's, a number of similar installations were made at proving grounds, arsenals, naval bases, and similar locations where great distances made fast modern telephone switching facilities a necessity.

Continued use of this equipment by the armed services has been in part the natural consequence of its ruggedness and its ability to stand up under the most rigorous climatic and battle conditions. It was these qualities in particular that led the United States Navy during the early '20's to collaborate with Automatic Electric engineers in the design of the first "ship's service telephone systems." First used on light and heavy cruisers, these systems quickly proved their ability to withstand the shocks and stresses of heavy gunfire, and later made their appearance on battleships and carriers as well as on auxiliary vessels of various types.

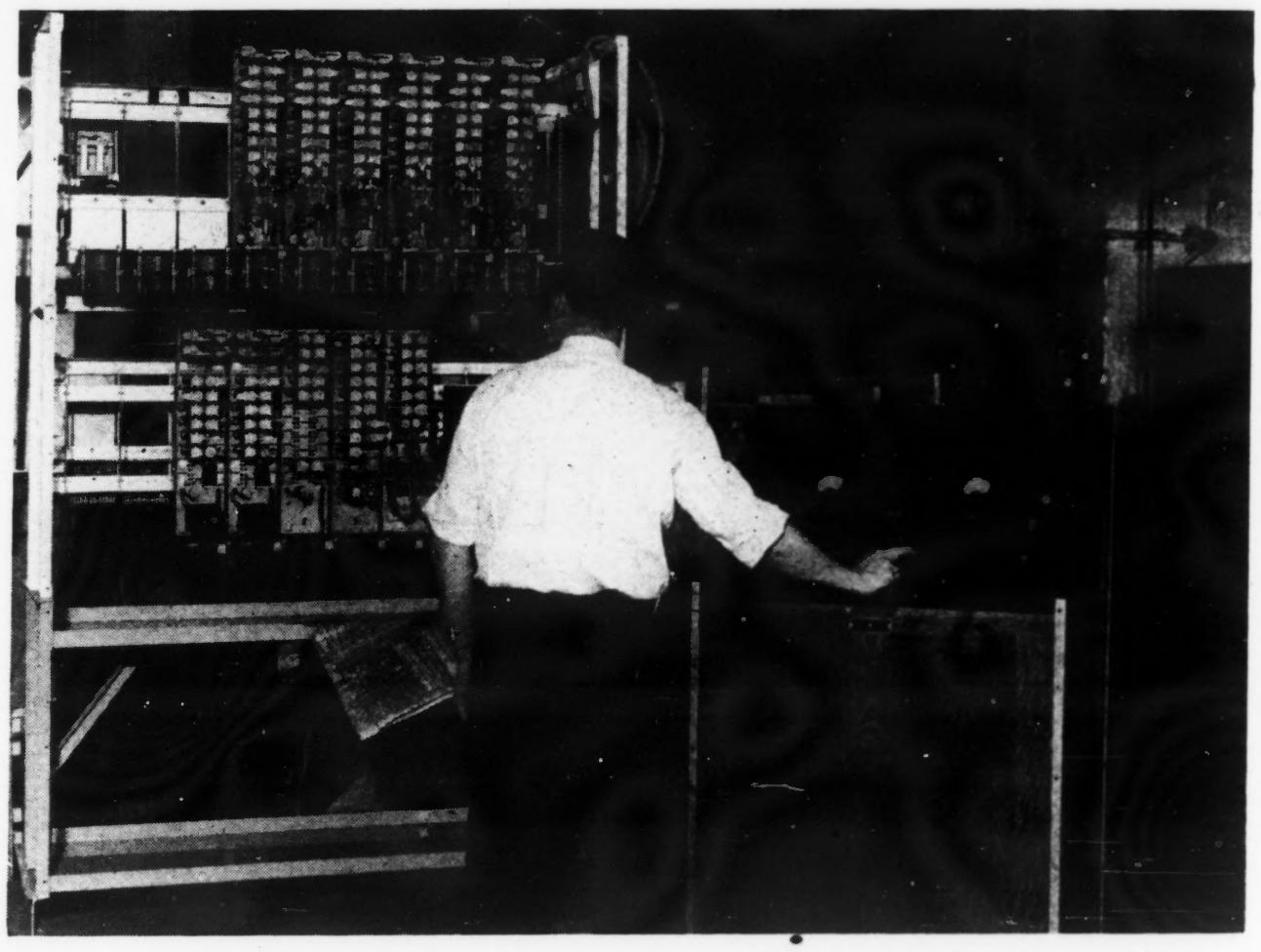
During World War II, the major part of Automatic Electric's automatic switchboard production was diverted to the needs of the armed services. In addition to the installations on naval vessels already mentioned, large quantities of similar equipment were required to provide telephone service in training camps, airfields, naval bases, munitions factories, ordnance plants and other essential war activities. Many of these installations exceeded 1000 lines in capacity—large enough to meet the normal communication requirements of a fair sized city.

While the development, engineering and manufacture of automatic switching equipment is the mainstay of the Company's business, Automatic Electric also designs and manufactures all of the auxiliary apparatus and devices without which no telephone exchange is complete. This includes the necessary power supply equipment, special service manual switchboards, and attendent's desks, distributing frames and terminal equipment, protective apparatus, and, of course, a comprehensive range of modern telephone instruments for every purpose. The Automatic Electric line of Monophones in their several wall and desk types are widely used by all branches of the armed services.

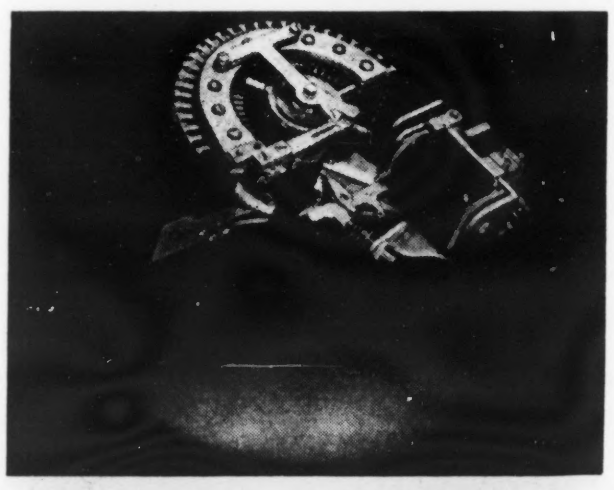
At various times, Automatic Electric has also been called upon to supply many types of specialized communication apparatus to the armed services. Included among these are the familiar sound-powered telephones, which are capable of supplying telephone communication over considerable distances without any source of power except that provided by the human voice, and such apparatus as field telephones and switchboards, and many types of communication and control devices for aircraft and air stations.

A further branch of Automatic Electric's business, and one of constantly growing importance to military needs, is concerned with the design and manufacture of electrical control components, such as relays and stepping switches, and their application to the products of other companies manufacturing military equipment. Many of these devices are adaptations of the same components that are regularly used in automatic telephone switchboards and long ago attracted the attention of industrial engineers and designers because of their reliability and high endurance characteristics. To manufacturers having need for electrical control apparatus and techniques, they offer the benefit of long life and

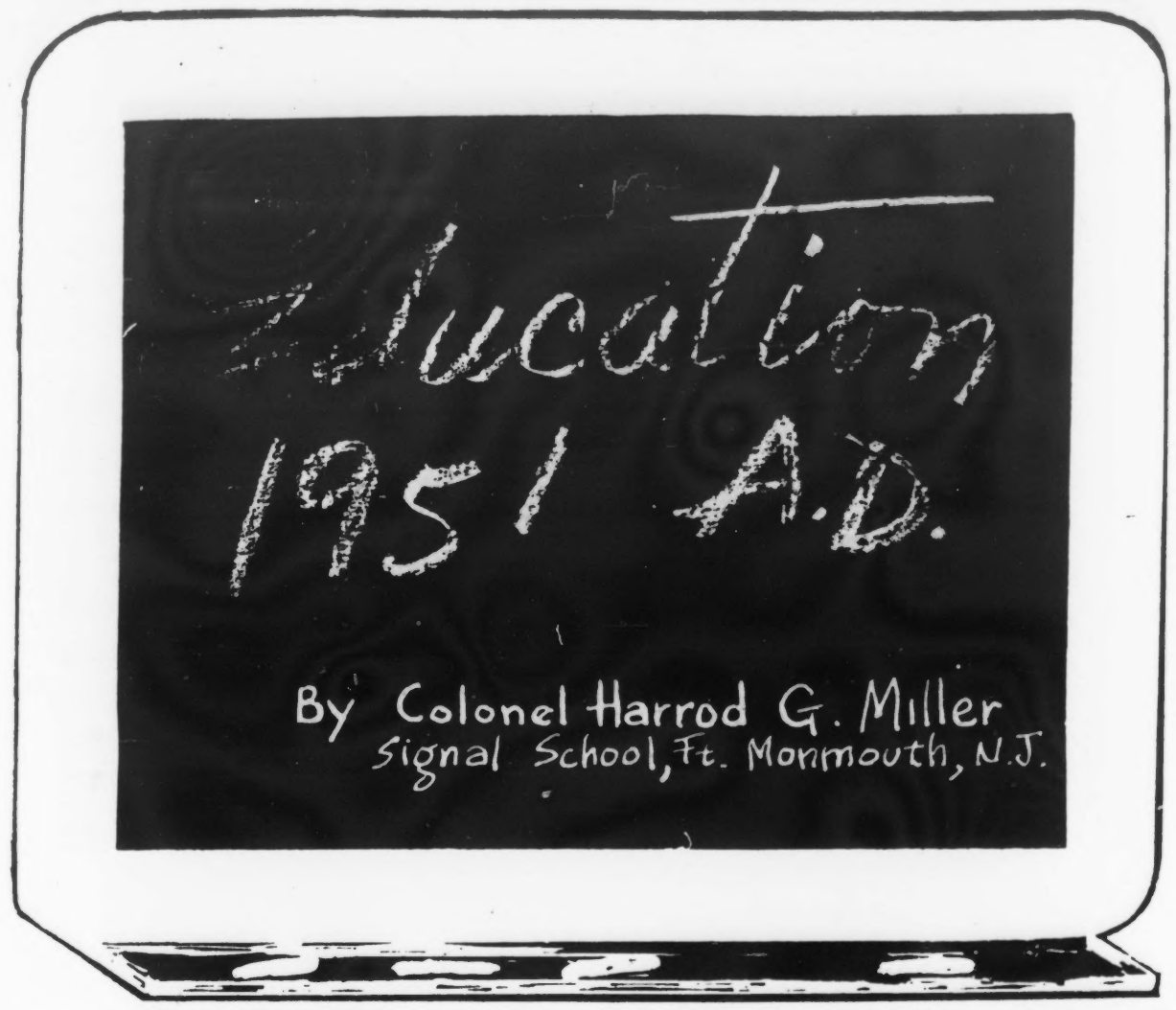
(*Continued on page* 80)



Quality control at every step of manufacture is exemplified in this inspection operation in which every switch is tested for circuit and mechanical performance under rigid tolerance conditions.



Left: Automatic Electric stepping switches and relays are widely used for electrical control in many military devices. Here are two typical components from the hundreds of types currently being manufactured—a type 45 rotary switch and a class "B" twin control relay.



(Since this article was set up Col. Miller has gone to an assignment in the Office of the Secretary of Defense, Washington, D. C.)

When Alexander the Great asked his tutor Aristotle to show him the short cut to knowledge, Aristotle made the well-known reply that there was no such short cut. And even today, one could hardly say that the great majority of educators do not readily agree with Aristotle's terse observation. But many teachers today simply *must* find short cuts to knowledge because the almost incredibly rapid progress in our technical civilization has made it practically mandatory that today's students learn much more than had to be learned even by the technicians of fifty years ago. Moreover, the dictates of our highly specialized and competitive society require that this greatly expanded knowledge be obtained in a shorter length of time.

In few other fields has progress been so great or the possibilities so challenging as in the study of electronics. Since modern communications equipments and techniques are based almost entirely upon electronic principles, any student in the communications field is confronted with an enormous increase in the complexity and amount of what has to be learned.

The Short Cuts

Educators of the Army Signal Corps, together with their civilian colleagues, are therefore faced with the seemingly impossible mission of devising new educational methods and teaching techniques which parallel this unprecedented advancement in the science of electronics. At The Signal School at Fort Monmouth, New Jersey, this pioneering research has produced what is believed to be several refinements in the concept of teaching. This particular military institution is one of the largest technical or trade schools in the world, having an enrollment, even during the so-called "peace" year of 1948, of almost 7,500 students. Now that the country is entering a period of rearmament, the number of students may well exceed this figure.

Many unusual teaching situations exist in the "educational laboratories" of this Signal Corps school, and touch on numerous facets of the communications sciences. The school offers nineteen courses, including seven technical specialties in radio; two fields in radar; four fields in telephone and wire carrier communications; one trade concerned with teletype installation and maintenance; and five specialties in the photographic field. However, the difficulties resulting from the need for acceleration in the development of the teaching arts, imposed upon the military educators of The Signal School, become more understandable if one considers that higher Army echelons establish the scope of instruction for each technical specialty and the maximum time allowed to complete this instruction and bring the student to the prescribed degree of proficiency.

The effect of such dicta is even more apparent when one studies the difficulties involved in teaching young soldiers the specialized knowledge and the techniques required to install and maintain the more complicated electronics equipments such as radar in its many applications, multi-channel carrier telephone apparatus, or single side-band multichannel raido. There is much merit in the practice of those in charge at Cornell who require some of their Romance language instructors to study Hindustani so that these instructors will be continuously impressed with the difficulties incident to learning a foreign language.

These decisions prescribing the knowledge and proficiencies that must be acquired in a given time would appear arbitrary were it not for the fact that they are predicated upon the dominant part that *time* plays in the military scheme of training. For in war, time is unquestionably the most precious commodity: given time enough, all other necessities of war can be created. The length of time for educating our soldiery in the many technical skills demanded by present day electronics developments is therefore an inflexible factor in the teaching mission.

Moreover, we cannot say with authority that our society today has produced individuals of any greater intelligence, or capacity to learn, than those of previous civilizations. The ancient Greek, for example, was certainly very intelligent by any standards, and indeed has been often thought to have had intellect far in advance of his times. One need only to study the scholarly Plato, the mathematician Pythagoras, or the philosopher Socrates to visualize the mental stature of people of that age. And the Rennaissance brought forth such men as Plutarch, Michelangelo, and Palladio, the architect, all of whom were outstanding leaders in their fields of endeavor. That the level of human intelligence has not markedly changed in the more recent stages of our civilization, is also indicated by the fact that the Elizabethan

Selected questions mounted in open windows and circuits arranged to correspond to correct answers makes this class participation training aid valuable.

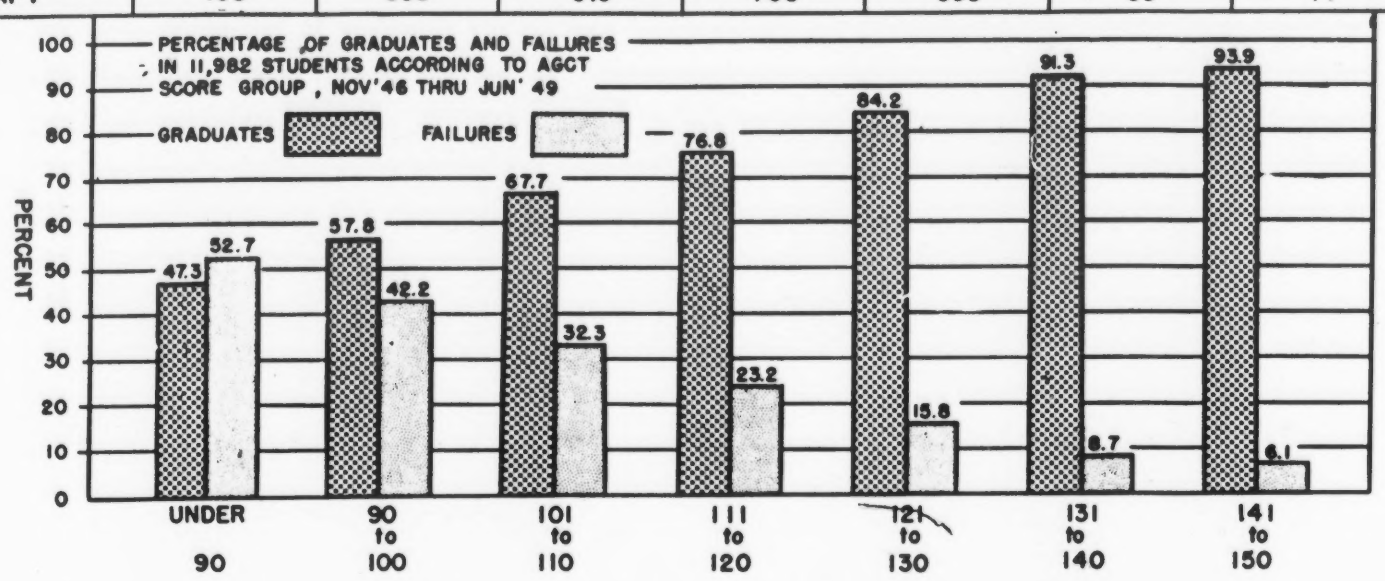
THE SIGNAL SCHOOL

ENLISTED DEPARTMENT
FORT MONMOUTH, N.J.

PARTIAL LIST OF GRADUATES AND FAILURES BY AGCT SCORES

AGCT SCORES FOR REMAINDER OF GRADUATES WERE NOT AVAILABLE

STATUS OF TNG \ AGCT SCORE	UNDER 90	90 to 100	101 to 110	111 to 120	121 to 130	131 to 140	141 to 150	TOTALS
GRADUATES	149	1217	1932	2619	1976	663	219	8775
INAPT	168	888	919	790	365	63	14	3207



AGCT SCORES DISTRIBUTION ACCORDING TO MOS

STATUS OF TNG \ AGCT SCORES		UNDER 90	90 TO 100	101 TO 110	111 TO 120	121 TO 130	131 TO 140	141 TO 150	TOTAL
MOS-0039 CABLE SPLICER *	GRADUATES	24	176	158	85	21	5	0	469
	INAPT	47	73	29	22	8	0	0	179
MOS-0042 CAMERA REPAIRMAN	GRADUATES	0	0	3	2	1	0	0	6
	INAPT	0	0	0	0	0	0	0	0
MOS-0043 CAMERAMAN MOTION PICTURE	GRADUATES	1	5	14	15	10	1	2	48
	INAPT	1	1	4	1	0	1	0	8
MOS-0095 CENTRAL OFFICE TECHNICIAN	GRADUATES	2	105	173	173	110	32	3	598
	INAPT	5	135	90	46	17	3	0	296
MOS-0097 INSTALLER REPAIRMAN	GRADUATES	56	283	359	324	143	25	4	1194
	INAPT	44	104	50	34	4	1	0	237
MOS-0115 AUTOMATIC TELEPHONE SYSTEM MAINTENANCE	GRADUATES	6	57	95	146	111	35	10	460
	INAPT	4	49	41	11	8	1	0	114
MOS-0152 PHOTOGRAPHER STILL	GRADUATES	0	6	38	30	18	8	4	104
	INAPT	0	2	18	6	1	1	0	28
MOS-0166 POWERMAN *	GRADUATES	28	177	200	232	91	22	5	755
	INAPT	5	61	25	18	2	0	0	111
MOS-0187 REPEATERMAN	GRADUATES	0	14	48	72	64	14	7	219
	INAPT	0	13	23	8	2	0	0	46
MOS-0208 SOUND RECORDING TECHNICIAN	GRADUATES	0	0	0	0	1	0	0	1
	INAPT	0	0	0	0	0	0	0	0
MOS-0239 TELETYPE MECHANIC	GRADUATES	4	125	207	222	156	37	4	755
	INAPT	8	95	66	32	20	1	0	222
MOS-SCM COMMON DIVISION	GRADUATES	0	0	0	0	0	0	0	0
	INAPT	1	62	45	7	3	0	0	118
MOS-0648 RADIO REPAIRMAN	GRADUATES	3	40	125	331	309	125	39	972
	INAPT	13	73	186	196	93	18	5	584
MOS-0649 RADIO REPAIRMAN FIXED STATION	GRADUATES	1	4	19	45	38	14	10	131
	INAPT	1	2	27	19	8	1	1	59
MOS-0740 RADIO OPERATOR INTERMEDIATE SPEED	GRADUATES	2	15	14	35	28	8	5	107
	INAPT	2	4	4	5	1	2	0	18

STATUS OF TNG \ AGCT SCORES		UNDER 90	90 TO 100	101 TO 110	111 TO 120	121 TO 130	131 TO 140	141 TO 150	TOTAL
MOS-0766 RADIO OPERATOR HIGH SPEED	GRADUATES	18	154	335	627	534	198	53	1919
	INAPT	37	191	268	342	165	28	6	1037
MOS-0775 RADAR MECHANIC	GRADUATES	0	0	3	10	5	3	2	23
	INAPT	0	0	0	0	0	0	0	0
MOS-0776 RADIO OPERATOR LOW SPEED	GRADUATES	1	4	13	14	14	3	1	50
	INAPT	0	0	0	0	0	0	0	0
MOS-0792 RADIO REPAIRMAN, SINGLE CHANNEL RADIO T. T.	GRADUATES	1	6	17	33	26	10	6	99
	INAPT	0	1	7	6	6	1	1	22
MOS-0805 CRYPTOGRAPHIC † TECHNICIAN	GRADUATES	1	30	73	139	175	69	37	524
	INAPT	0	22	32	33	26	5	1	119
MOS-0945 PHOTO LABORATORY TECHNICIAN	GRADUATES	1	4	15	15	14	6	0	55
	INAPT	0	0	2	2	1	0	0	5
MOS-0952 RADAR REPAIRMAN GUN-LAYING EQUIPMENT	GRADUATES	0	3	9	37	76	37	21	183
	INAPT	0	0	1	2	0	0	0	3
MOS-2649 RADIO REPAIRMAN SINGLE SIDE-BAND	GRADUATES	0	1	2	8	6	6	1	24
	INAPT	0	0	0	0	0	0	0	0
MOS-3649 MULTI-CHANNEL, MICRO WAVE RADIO RELAY TECH	GRADUATES	0	0	0	6	8	1	2	17
	INAPT	0	0	1	0	0	0	0	1
MOS-0894 FACSIMILE TECHNICIAN	GRADUATES	0	8	12	18	17	4	3	62
	INAPT	0	0	0	0	0	0	0	0

THE ABOVE REFLECTS DISTRIBUTION OF 11,982 STUDENTS RELIEVED FROM SCHOOL DURING PERIOD, NOV 46 THRU JUNE 49 ACCORDING TO STATUS OF TRAINING AND AGCT SCORE GROUPING EXCLUSIVE OF STUDENTS DROPPED PRIOR TO COMPLETION OF TRAINING FOR CAUSES OVER WHICH THE SCHOOL HAS NO CONTROL.

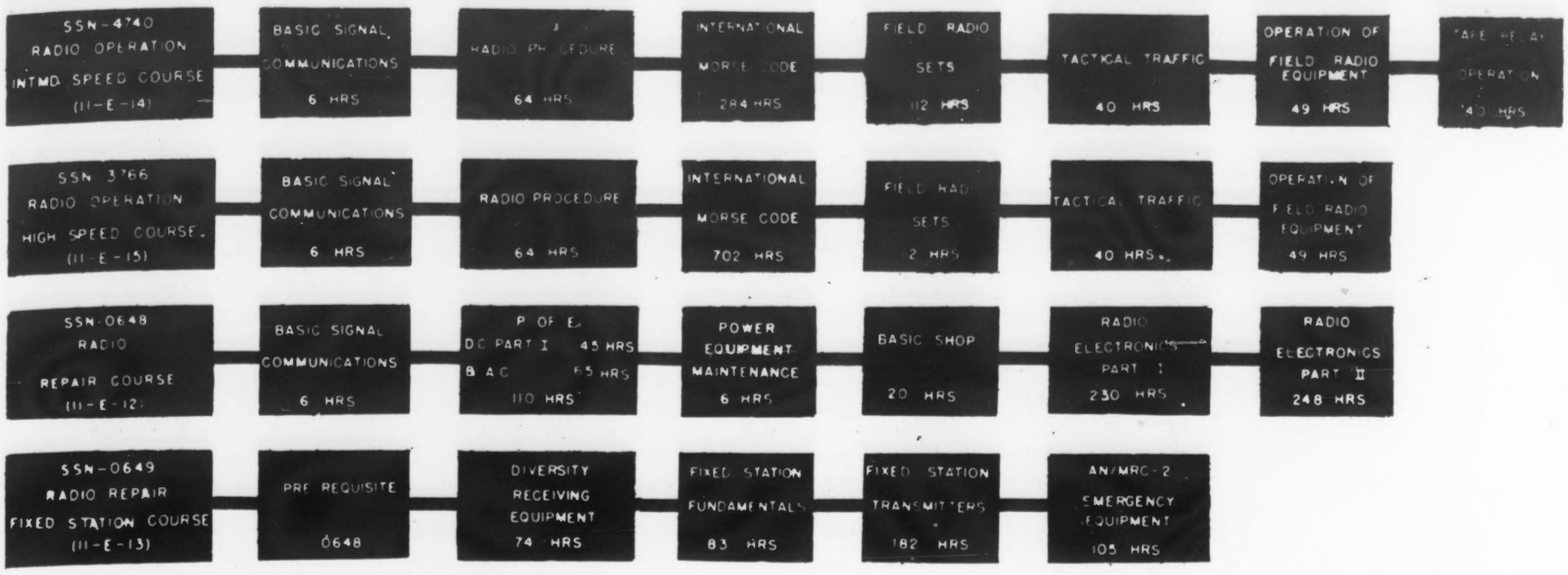
* THIS COURSE DISCONTINUED ON 16 JAN 1949.

† THIS COURSE DISCONTINUED ON 15 MAR 1949.

SUBMITTED BY James N. Rowell Lt Col Inf Exec T.S.S.
Director, ED

APPROVED BY Harold G. Miller Col Sig C.
Comdt, T.S.S.

10 APRIL 1950



All courses are organized into "cellular blocks of instruction" or instructional unities, which vary from five to five hundred academic hours in length. Many of these unities are common to several different courses, allowing flexibility in the transfer of students between courses.

and Victorian periods similarly produced their shares of highly intelligent persons. Consequently, it appears logical to postulate that today people in general are basically no more intelligent and have no greater capacity to learn that the last fifty generations of their ancestors.

Thus having examined three of the four major factors with which the military educator is concerned, that is, *subject matter, time and proficiency requirements,* and *student intelligence level,* let us consider *willingness* to work—the fourth factor.

Fifty years ago all but a small minority of people expected to work twelve hours a day for at least six days a week. As a matter of fact, telegraph operators formerly worked regularly twelve hours a day for *seven* days a week! Now people are generally unwilling to work more than eight hours a day for five days of the week. There is continuous pressure to have an accepted national standard of a thirty-five or even a thirty hour work week. And it has been only a short time since we had most of the coal miners working three days a week—and only working eight hours a day, including "portal-to-portal" time. If our indices to any special trend may be derived from this brief glance over the past half century, then we must admit that the mental conditioning of our contemporary student is certainly not toward *more* work, but toward increasingly less work! Such is the evolution of our society.

Left: Pictorial training aid displays the results of various degrees of photographic development both initial exposure and negative. Clearly shown to the student are the principles leading to better photography.

This then is the Chinese dilemna which faces those charged with instructing young soldiers in the theory, installation, operation, and maintenance of electronic communications equipments: *how to teach more and more in less and less time to people who are certainly no more intelligent and who are less willing to work.*

However, it is strange that, when something must be done, many times a way to do the seemingly impossible will be found. At The Signal School we have discovered that, while there may not be actual short-cuts to knowledge, there are means to accelerate learning: First, separate all difficult ideas and tasks into such small and simple parts that the assimilation or accomplishment of any one of them is not above the capabilities of the student at the level of training or skill at which he finds himself; and secondly, create training aids which by their (apparent) simplicity and appeal to the student's emotions, teach the student a basic understanding of the principles which underlie the functioning of the communications equipment that he is studying.

Simplification of operations has long been practiced in manufacturing, and there is nothing new in the simplification of instruction by developing ideas one step at a time. It is not intended to create an impression that The Signal School has fabricated a "production-line educational system." As a matter of fact, some of the "tools" employed in our approach to teaching, at least those used in the primary phases of Signal Corps instruction, were developed Army-wide and are common to all branches of the military.

Two major items in this category are the Army General Classification Test and the Test Battery which include

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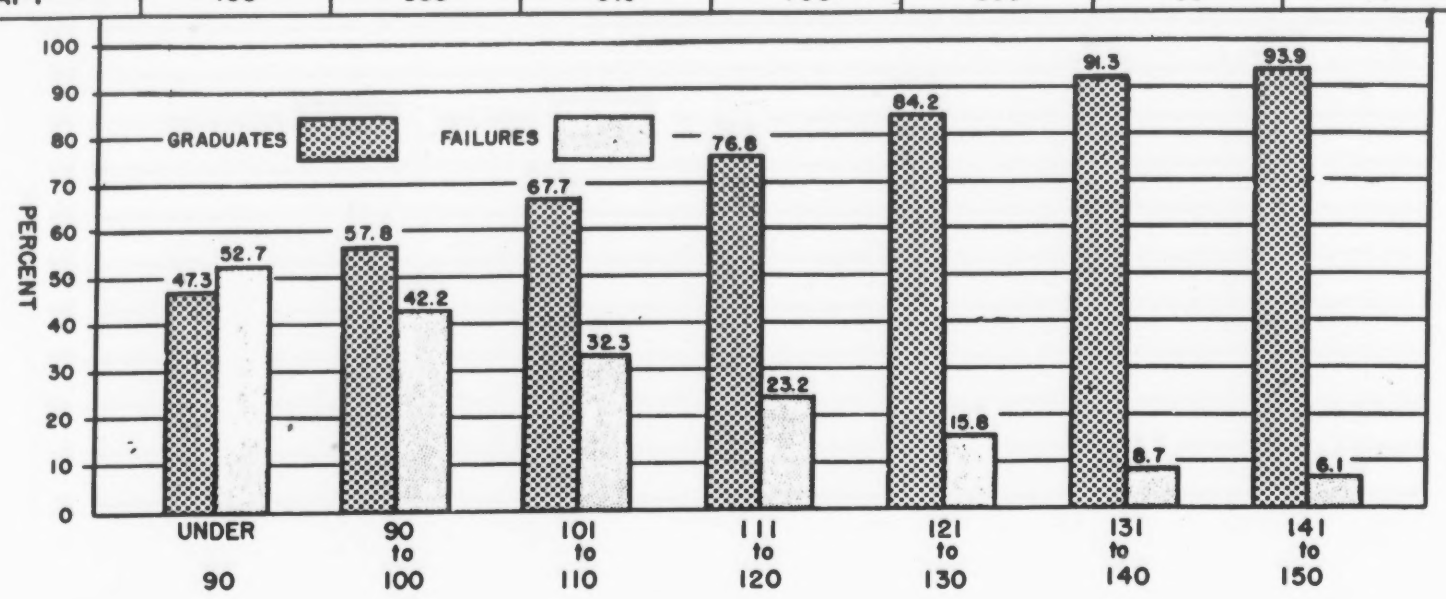

GRAPH SHOWING PERCENTAGE OF GRADUATES AND FAILURES OF 11,982 ENLISTED STUDENTS ACCORDING TO ARMY GENERAL CLASSIFICATION TEST SCORE GROUP, NOV. 1946 THROUGH JAN. 1949.

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MOS-0775 RADAR MECHANIC	GRADUATES	0	0	3	10	5	3	2	23
	INAPT	0	0	0	0	0	0	0	0
MOS-0776 RADIO OPERATOR LOW SPEED	GRADUATES	1	4	13	14	14	3	1	50
	INAPT	0	0	0	0	0	0	0	0
MOS-0792 RADIO REPAIRMAN, SINGLE CHANNEL RADIO T. T.	GRADUATES	1	6	17	33	26	10	6	99
	INAPT	0	1	7	6	6	1	1	22
MOS-0805 CRYPTOGRAPHIC TECHNICIAN	GRADUATES	1	30	73	139	175	69	37	524
	INAPT	0	22	32	33	26	5	1	119
MOS-0945 PHOTO LABORATORY TECHNICIAN	GRADUATES	1	4	15	15	14	6	0	55
	INAPT	0	0	2	2	1	0	0	5
MOS-0952 RADAR REPAIRMAN GUN-LAYING EQUIPMENT	GRADUATES	0	3	9	37	76	37	21	183
	INAPT	0	0	1	2	0	0	0	3
MOS-2649 RADIO REPAIRMAN SINGLE SIDE-BAND	GRADUATES	0	1	2	8	6	6	1	24
	INAPT	0	0	0	0	0	0	0	0
MOS-3649 MULTI-CHANNEL MICRO WAVE RADIO RELAY TECH	GRADUATES	0	0	0	6	8	1	2	17
	INAPT	0	0	1	0	0	0	0	1
MOS-0894 FACSIMILE TECHNICIAN	GRADUATES	0	8	12	18	17	4	3	62
	INAPT	0	0	0	0	0	0	0	0

SURVEY OF ENLISTED GRADUATES & FAILURES AT THE SIGNAL SCHOOL

SURVEY REFLECTS DISTRIBUTION OF REPRESENTATIVE GROUP OF 11,982 STUDENTS ACCORDING TO STATUS OF TRAINING (TECHNICAL COURSE PURSUED) AND ARMY GENERAL CLASSIFICATION TEST SCORE GROUPING

aptitude and proficiency measurements. An individual can usually be placed in technical courses most suited to his particular mental capabilities by a careful study of the grades he attains on these examinations. The General Classification Test is broadly designed to provide an indication of the individual's general intelligence level; and the Test Battery, which includes several different types of aptitude and proficiency tests, will reveal a generally accurate picture of the type of training for which the individual is best qualified.

This selection process, of course, is neither new in the Army nor is it much different in principle from the entrance examinations and enrollment requirements of civilian institutions. The practicality and validity of these tests are evidenced by statistics showing a comparison of the results for each individual student and the grades and proficiency attained by each student in his

instruction in the school. These statistics are regularly compiled by the School. A comparatively recent cross-sectional survey was based upon the individual records of nearly 12,000 students, and covered the various courses which are, or have previously been, offered by The Signal School.

Although such intelligence and aptitude tests have been in use for a long time, after the new student is assigned to a technical course of study at The Signal School, it is believed that some of the educational methods and techniques affecting his subsequent program of study are new.

Individual Analysis

All beginning students, except those enrolled in short term courses, receive basic instruction in the fundamental communications subjects, regardless of the eventual fields in which they will study. This particular phase of their instruction is presented in the Common Division; it is specifically intended to provide all students with a common technical background, prior to their advancement into the specialized study of a given field. Here a primary opportunity for rapid learning is offered the student, for he himself largely determines his individual academic progress. For example, outstanding students who already possess good technical backgrounds, or whose comprehension rate is greater than that of the normal student, may elect to take progress tests covering certain phases of their prescribed curriculum. Those students who attain satisfactory grades on these examinations are entered into more advanced study, and are not required to pursue subjects in which they have demonstrated the desired proficiency.

This practice is not limited to the Common Division, but is used throughout the divisions of advanced study in all the specialized fields; namely, the Radio, the Wire, and the Photographic Divisions. An underlying principle of the school's training system is "what can a student do, what does he know, and what degree of skill does he possess?" The *how*, *when*, or *where* of a student's educational qualifications are considered secondary to a reliable demonstration of proficiency in the subject or subjects concerned. Many advantages would accrue if other schools were to adopt the policy that what really matters in measuring a person's individual proficiencies is *what does he know* and *how well does he know it.* If a student can demonstrate proficiency in a required subject by the results he attains on an accepted examination, then of what real import is the "where" or "how" of his acquisition of this knowledge? It is true that the source and extent of a student's knowledge of a particular subject has a great deal to do with what one may expect of him in that field under different situations; these are therefore of course important considerations. However, the point is that a valid examination, covering both theory and practice, will also reveal these essential facts concerning subject proficiencies. Contrary to what some critics may conclude, this attitude does not endorse such a liberal policy which would allow unqualified students academic credit they have not earned; but it *does* advocate a forward-looking concept which requires a student only to demonstrate acceptable capabilities in the practical manner in which today's employers in business, industry, or Federal service are most vitally interested.

Another educational practice in effect at The Signal School which is believed to be unique, is one to which I might refer as "fractional distillation." Again, its motivation derives from the imperative need for improved methods of training to produce communication and other electronic technicians in the shortest possible time, starting with young men who normally possess at most a high school education. Its functioning is essentially as follows: When a group of recruits are received at the school, having been assigned as students as a result of their individual grades on the aptitude and intelligence tests referred to previously, they (with the exception of radio operators and photographers) are sent to the Common Division. Here they remain until they attain the required proficiency to move to more advanced work. During this training, their instructors observe them closely, and make a series of reports on each student, covering his *observed* and *demonstrated* abilities to absorb instruction and gain proficiency in a given technique. These reports, together with studies of the results of the tests taken prior to arrival at the School, permit the tentative assignment of each student to a given line of specialties—radio, wire, radar, etc.

However, in the school's efforts to separate all difficult ideas and tasks into small and simple parts, all curricula of the different courses which these students will then pursue have been organized into what may be termed "cellular blocks of instruction." These instructional units are complete phases within themselves, the general principle of which evolves from the teaching doctrine formed at the Department of the Army level, and which is therefore common to practically all military arm or service school curricula. These study unities are seldom, if ever, comprised of a single subject alone, but consist of related subjects which have been organized into associated study groups, conforming to the level of training and technical education possessed by the student when he commences them. They range from five to as high as five hundred academic hours in length, depending upon their placement in the phasing of the prescribed course and the complexity of the material they contain. Each of these cellular blocks is somewhat more difficult to master than the last, but their individual separation within the curriculum presents to them simple objectives of study. A student therefore masters a single portion of his course before entering the next phase. An added note of interest is that many of these instructional units are common to more than one technical course, thereby offering great flexibility in any transfer of a student between courses. Also, such organization provides for easier standardization of certain subject foundations that are pertinent to several different specialized fields.

To continue the "fractional distillation" analogy, the grades attained by each student for these instructional unities determine whether he will remain in the course to which he was tentatively assigned. Should a student show an inability to make suitable progress in the course, he may be transferred to a course in which the requirements for specialized skill and technical ability are considerably less. In cases where the student is still unable to progress satisfactorily, and medical consultation indicates no physical difficulties exist, he is relieved from attendance at the School because of inaptness. If it is revealed that a student's academic deficiencies are the result of medical reasons which are not correctable with-

Colonel Harrod G. Miller, who served as deputy chief signal officer of the European Theater of Operations in 1945, is now the deputy commander for training and commandant of The Signal School at the Signal Corps Center, Fort Monmouth, New Jersey. He is in charge of the training of thousands of officers and enlisted personnel in all phases of Army communications work.

A native of Kahoka, Missouri, and a graduate of West Point, Colonel Miller also holds a Master of Science degree from Yale, and studied Advanced Business Management at Harvard Business School.

In addition to the assignment as deputy chief signal officer in Paris under Major General F. H. Lanahan, Colonel Miller also served during World War II as signal officer of the Eighth Fighter Command in England and as signal officer in the North African Theater of Operations.

Colonel Miller's decorations include: Legion of Merit with Oak Leaf Cluster; Bronze Star; Legion of Honor; Croix de Guerre, three citations; Croix de Service; French Foreign Legion; Crown of Italy; Officer of the British Empire; Order of Leopold; and Palmes Academique.

in a reasonable length of time, his relief records indicate that such is the case.

When the students satisfactorily complete their specialized courses of instruction, the very best soldier graduates are selected for further training in higher level technical courses. These selections are again based upon *observed* and *demonstrated* abilities, instructor reports, and the student's individual grades. For example, a certain percentage of the students who are graduated from the Radio Repairman Course are enrolled in advanced technical courses such as Radar Repair and Maintenance or Single Side-band Multichannel Radio. Assuming that these selected students entered the Radar Repair and Maintenance Course, this selective screening process would occur again when they were graduated from this second course. And a certain few of them would then be entered in the most highly technical and complex radar courses offered at the School. At each level or end of a phase of training for a particularly technical specialty, then, this "distillation" process takes place. The students having the highest scholastic standings are enrolled in the next higher and progressively more difficult technical courses.

Spirit of Competition

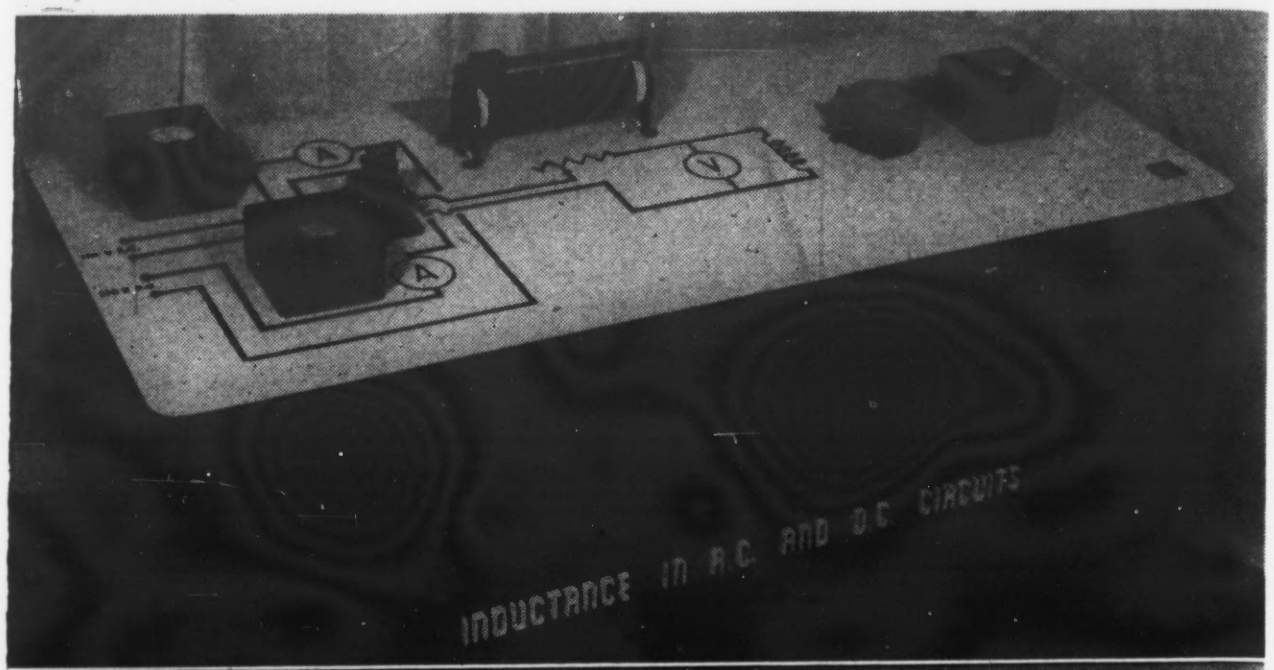
Advanced Management as taught at the Harvard Business School, stresses the importance our emotions play in almost everything we do — and the (perhaps too frequent) dominance of emotion over logic. And I vaguely remember a Sunday School lesson many years ago which related how David acquired his skill with a sling shot in knocking down his lunch every day from a high pole. Even as long as Old Testament times, people were impelled to acquire skill through one of the most primitive of our feelings—hunger.

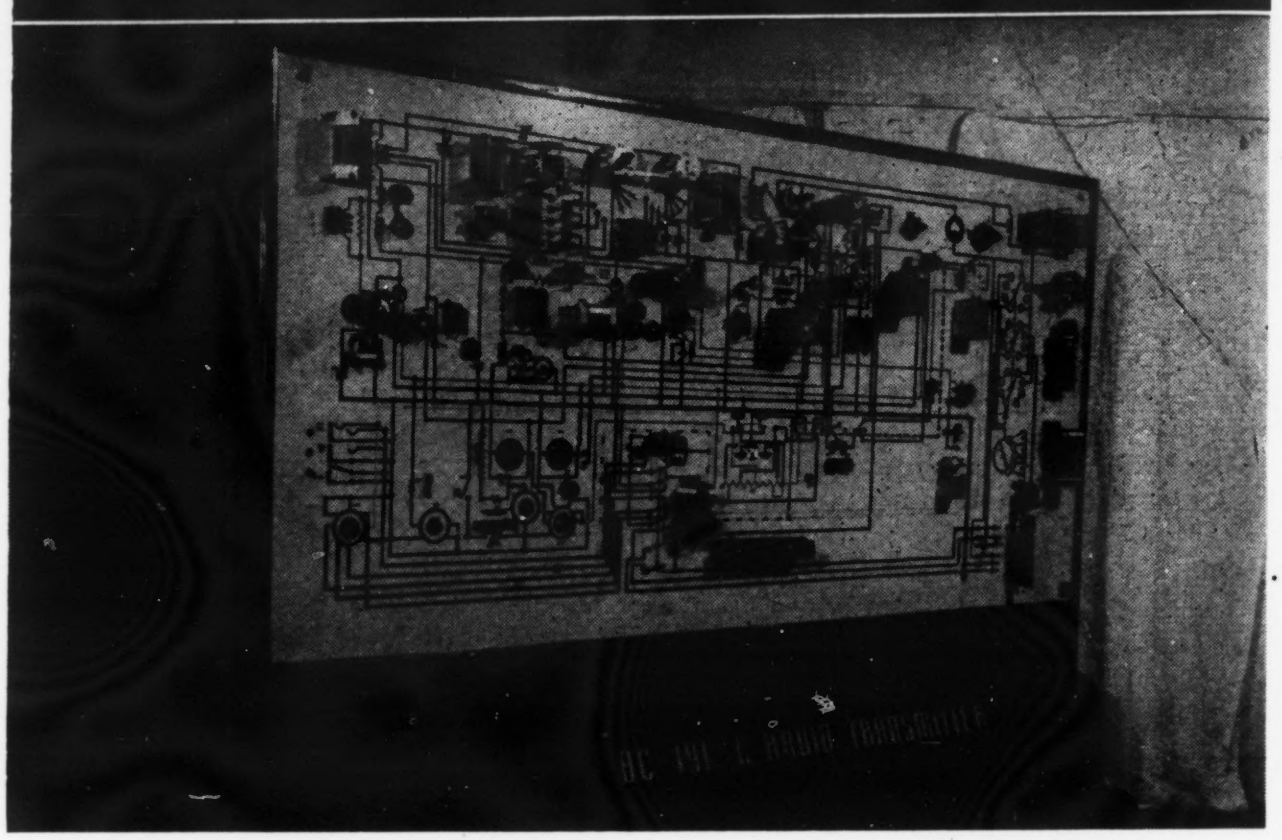
So it was decided at The Signal School to attempt to take advantage of the emotional side of soldiers in order to teach them as competently as possible not only basic technical knowledge and facts, but also to instill in their minds both fundamental ideas of theory and practical but often abstract principles of operation.

It is a rare young American indeed who has no spirit of competition. Based upon this emotional urge, many types of training aids have been constructed to teach students hundreds of basic facts concerning electronics, fundamentals, symbols, units of measure, and similar factors involved in the study of the communications sciences. An illustration of a class participation type of training aid, which plays upon this competitive urge in our people, is an electrically operated, objective-type examination board. The aid itself is in effect a large display panel, upon which may be mounted a series of prepared questions. By proper arrangement of the electrical components, transparent glass circles, labelled "true" or "false," can be made to illuminate when a student selects the foot lever associated with either of the two answers. When an incorrect answer is selected by the student, an indicator light which corresponds to the particular question involved is illuminated, thereby giving a visual and cumulative indication of the student's score on the examination.

A most important type of training aid is the one which shows the actual but simplified operation of an item of communications equipment. For example, one that is used to teach the construction and operation of the automatic switch train found in dial telephone exchanges. The dial selection equipment is mounted in transparent cases, and two standard telephones, separated physically by approximately seven feet, are connected to the system. The device illustrates to the student in a very few minutes the many complicated mechanical and electrical operations which occur when one simply dials the telephone in seeking a number. Of course, after the student is familiar with the equipment, he can then be instructed in the individual components of the

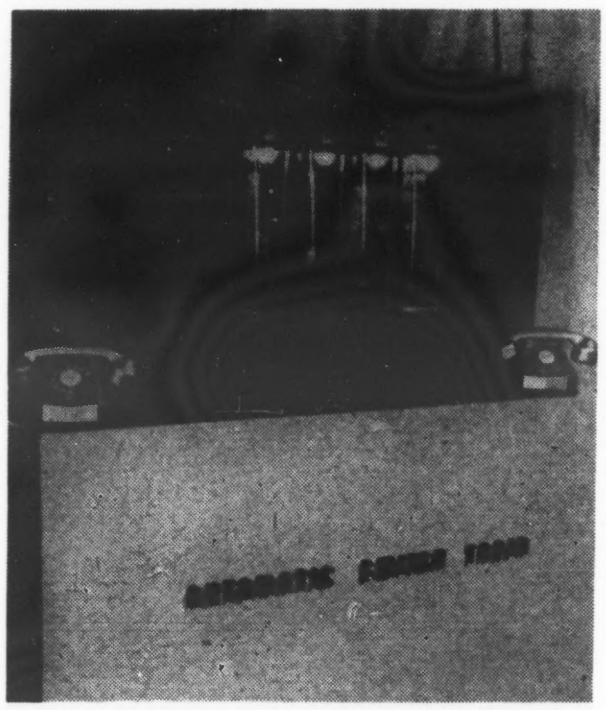
(*Continued on page* 76)





Lower: Based upon the student's desire to know "What makes a thing tick" this aid is used to teach the basic and advance features of a military radio transmitter.

Dynamic operational training aid, illustrates the construction of an automatic switch train in dial telephone exchanges and the operation of the equipment.



THE GRAY AUDOGRAPH

One of the most remarkable achievements in modern times is the progress made by man in increasing the efficiency and accuracy of recorded thoughts. History began with the first discovery of how to write. Each new era brought changes in language, and changes in written alphabets as well as methods of writing. The invention of the printing press in the 17th century is considered to have marked the beginning of the industrial revolution. The development of the typewriter by William Austin Burt in 1829 made possible an annual volume of correspondence that truly startles the imagination.

Today, the business world is witnessing a further revolution in techniques of writing that will bring even far greater advances in efficiency and the working capacity in almost every field of human endeavor. This brand new revolution is taking place through the development of the technique of writing in sound.

The development of the dictating machine dates back to experiments conducted by Thomas Edison in 1877 and later Chichester Bell, Sumner Tainter and Alexander Graham Bell applied for the first patent in 1886. Many improvements in product design, both electrically and mechanically, were made in succeeding years, but it was not until recently that a compact, handy, reliable, easy-to-work instrument was developed for use by the average executive and his secretary.

Instrumental in developing the newest type of dictating machine was Walter E. Ditmars, president of the Gray Manufacturing Company of Hartford, Conn. Originally known as the Gray Company, this organization was founded in 1891 for the purpose of manufacturing telephone pay stations. In the early 1930's the basic patents of the pay station expired, and the Bell system began to manufacture its own pay stations. Shortly after this, under the direction and leadership of Mr. Ditmars, the company was reorganized, and a research program was initiated in the field of instantaneous and reliable electronic voice recording and reproduction. This led to the development of the Gray Audograph.

The electrical experience of the company, and the naval and military experience of the management, led to an early contribution to the defense effort in the late 1930's. The company volunteered its services in the industrial mobilization plan as early as 1938, and recording machines suitable for military needs were developed. These included variable speed recording models, several of which, it is understood, were serving at Pearl Harbor during the bombing.

Other Audographs were supplied to the Signal Corps, and continuous recording models were used by the Federal Communications Commission to monitor foreign radio programs on a 24 hour a day basis throughout the war period.

During the war, Gray production facilities were also used to manufacture electro-mechanical radar assemblies and metal spinnings produced of magnesium, aluminum and steel for which the company won three Army and Navy "E's." Gray also produced Colt 45 caliber pistol hammers and other gun parts; and developed the automatic keyer, an electronic code training device used to teach military personnel the Morse Code.

The Audograph itself was developed as the first soundwriting machine employing a disc type of medium to operate at a constant groove speed, assuring uniform recording quality at all radii of the record. This principle of constant linear surface speed while recording on unbreakable plastic discs, has proven to be the ideal method of sound recording since it eliminates the variable recording quality which is characteristic of all phonographic and disc recording equipment which follow the principle of constant angular velocity.

Constant groove speed is attained by elimination of the customary turntable, and through the use of a screw driven record carriage and a fixed drive roller turning at 100 revolutions per minute. Recording and reproducing styli, mounted in the same head, do not move

President of the Gray Manufacturing Company, Mr. W. E. Ditmars, uses the Gray Audograph with a hand microphone. The design of this hand microphone is similar to that of a telephone receiver, since it has proven to be easy to handle.

across the disc during recording as is customary practice. Instead, the disc moves in relation to the styli. This procedure is made possible by the unique manner in which the record is driven in rotation, and traversed in a direction parallel to the front of the machine.

Two rollers flexibly mounted adjacent to the drive roller support the record on its underside. Thus, the inertia of a turntable is eliminated, insuring instantaneous starting and stopping of the record.

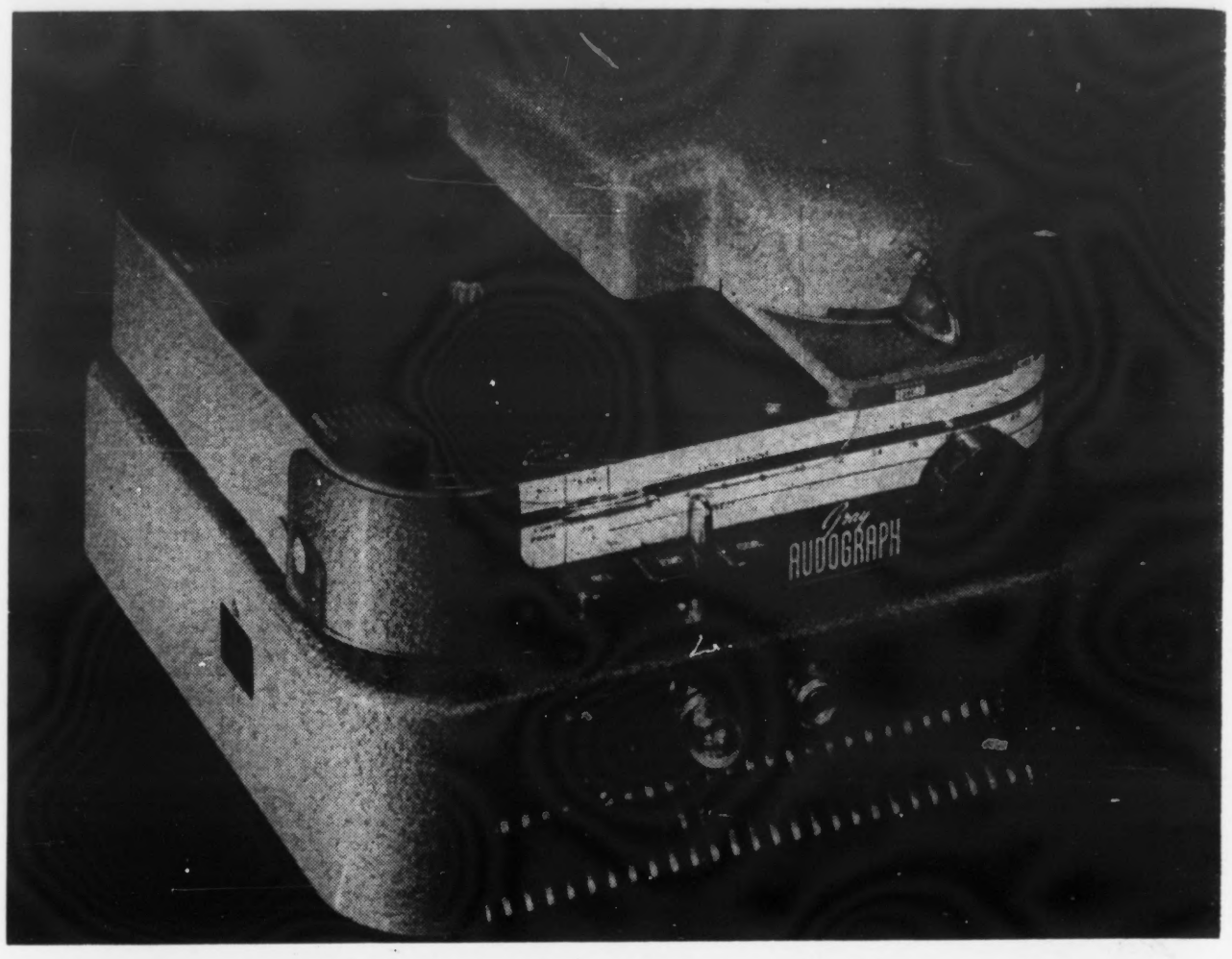
Microphones

In addition to its unique design features, the Audograph has a number of special operating features. A well designed hand microphone is streamlined for instantaneous start-stop action through a light pressure on a control bar handle. Lapel microphone for speakers and desk mikes for conference recording are also manufactured.

There is an electromatic index which enables dictator or secretary to see at a glance just where he or she may be on the disc. By dialing a radio-like control at the right of the instrument quick scanning of previously dictated material or review of corrections is instantaneous —with pinpoint accuracy. Perforations on the strip, which are made by pressing one of two keys at the front of the machine, indicate length of letters or letter endings and corrections.

The Audograph was first put on the commercial market in 1947, at which time an international sales and service organization was built to merchandise it. It made inroads in the competitive field almost overnight, and its rapid acceptance has resulted in its taking second place in the industry after only four years of production This expansion is completely without precedent in the field.

In general, Gray estimates that improvements in the past four years have resulted in a 45% reduction in manufacturing costs. At the same time, the useful life of the machine has been considerably increased, performance much improved, servicing operations made easier, and the rate of production steadily increased without effecting any major changes in appearance.



Newest electronic recording device on the market Gray audograph was originally produced for military use during World War II. Today it is widely used by businessmen.

On the original machine the two parts of the main frame were sand castings. These have now been replaced by die castings, and a number of the previously drilled holes are cast in. Flat, internal bosses are cast inside the frame for mounting the record carriage slide rods to avoid drilling through the sides of the frame.

Mohair strips are mounted on the top deck by strips of double-backed adhesive tape, and replace the original record support which consisted of seven small steel balls forced into holes drilled in the deck. At first, a liquid adhesive was brushed on, and although this was satisfactory from a performance standpoint, it was unsuited for production and necessitated an additional cleaning operation. The adhesive tape, dispensed from a motor-driven dispenser, has lowered production time 28%.

Plastic Moldings

The plastic guide for the index strip was formerly fabricated from vinylite sheet by bending under heat, and was fastened to the frame by four spacers. Now it is molded of Plexiglas in one piece, ready for installation, and incorporates a redesigned cutout to simplify use of the index strip. Also, the "Audograph" name and the "Record" and "Listen" titles are incorporated in the mold, eliminating the expensive hand engraving formerly done on the metal frame.

An interesting mechanical change has been made in the mechanism used to maintain constant, regulated pressure of the record disc against the recording and reproducing styli, regardless of the thickness variations. The original unit was composed of 23 individual pieces and employed only one roller. The latest model provides support with two rollers mounted on a pivoted yoke that has lateral freedom under spring tension. This provides an allowance for lateral and vertical motion within the desired close limits, but avoids the necessity for manufacturing

(*Continued on page* 74)

Robert Castrignano, CBS engineer, and Chester Hayes of Gray Research & Development Co. shown at the IRE 1951 exhibit at New York, where CBS demonstrated color television, using the Gray industrial color receiver.

TEMCO

During the late stages of the construction of K4USA, the control station of the Military Amateur Radio System located in the main concourse of The Pentagon, the elaborate equipment inside the room became faintly visible through the soaped-up glass windows and attracted much attention from Department of Defense workers and visitors. Among the latter one day was a Signal Corps officer just in from overseas. He pressed his nose against the glass, peered inside and remarked to a companion, "Hm, this looks like another of Mort Kahn's beautiful jobs."

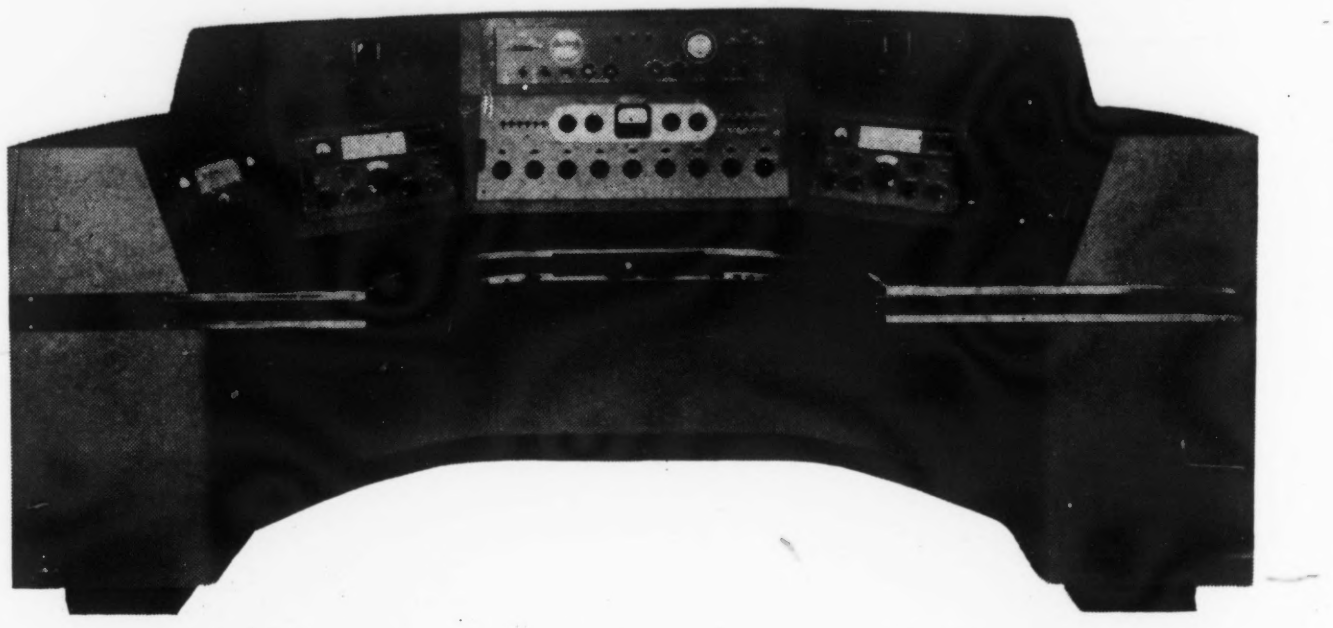
He was right. If he had been able to see more clearly through the glass, he might have noticed Kahn himself and several of his associates working feverishly with Signal Corps technicians to complete the installation for the announced opening date of October 24, 1950.* They succeeded, and Kahn was rewarded with a personal letter of thanks from Major General Spencer B. Akin, then Chief Signal Officer of the Army.

Turning out "beautiful jobs" is now a habit of long standing with Morton B. Kahn. After previous experience in the communications industry dating back to 1921, he organized the Transmitter Equipment Mfg. Co., Inc. ("TEMCO") in 1936, with a special objective in mind. He had observed that many radio manufacturers using mass production methods were slow in adopting current engineering developments; after tooling up expensively for a particular item, they were understandably reluctant to stop and add small new improvements fresh from the laboratory. In TEMCO, he thought he could strike a happy balance between quality and quantity by combining research skill and flexible manufacturing methods, the latter being geared to take immediate advantage of the former.

When Kahn announced that he intended to start with a semicustom built transmitter for the amateur market, his friends predicted a short life for his high-sounding company. They pointed out that while amateurs bought factory-made receivers costing hundreds of dollars, they usually assembled their own transmitters out of odds and ends of components. An active amateur himself (his station W2KR is known to "hams" all over the world), he figured that a neat, well-designed, fully self-contained transmitter in an attractive cabinet might be a welcome change from the hay-wire rigs found in most stations. His hunch—and the craftsmanship of his workers—paid off.

Buyers of TEMCO transmitters sang their praises over the air, and said that they had moved their stations from the cellar or attic to the living room because the equipment looked so eye-catching. When any of these owners hooked up with Kahn on the short waves, the conversation was always on one subject!

In the short period between the inception of the company and the start of World War II, TEMCO established a solid reputation for a growing succession of high-grade transmitters and related equipments for police, marine, point-to-point commercial, amateur broadcasting and mobile service. These ranged in size from small 10 watt automobile sets to huge 10,000 watt broadcasting stations, yet all bore certain family resemblance that identified them immediately as TEMCO products. The clean, functional lines of the control panels, the orderly, logical placement of the chassis elements, the neat accessible arrangement of the wiring, all contributed to that characteristic appearance.



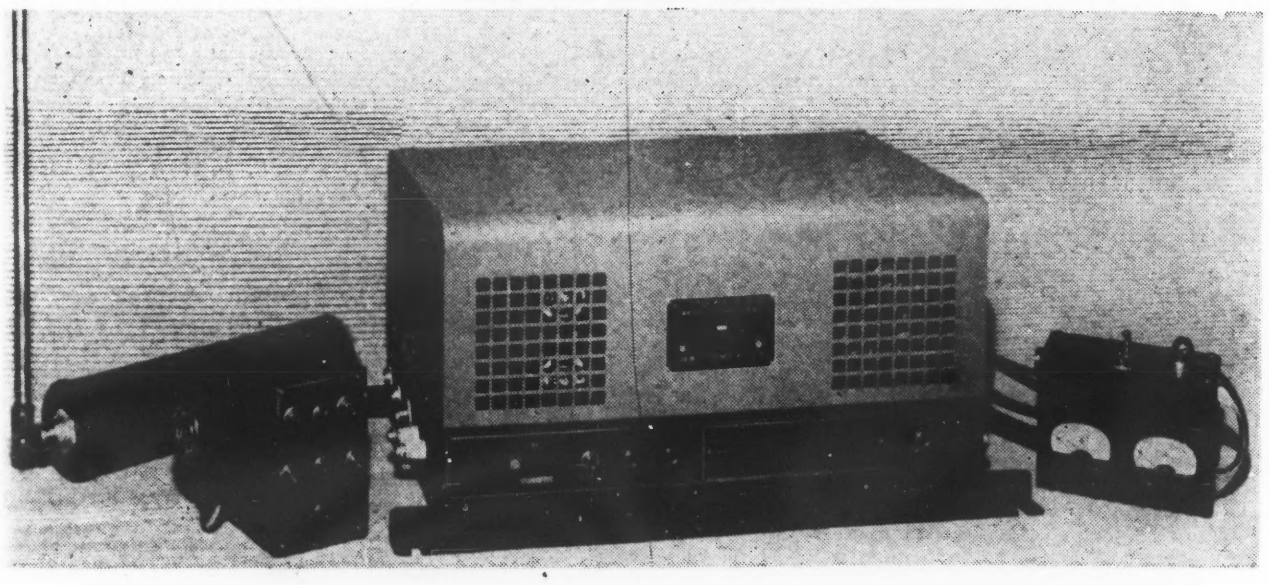
Master control console used in MARS headquarters station of the Air Force and Army, Pentagon designed and manufactured by TEMCO.

Kahn's insistence on meticulous workmanship and thorough testing had the effect of limiting his production. This didn't bother him or his customers. He knew that if he relaxed his standards and pushed his production rate up, his product would quickly lose its deluxe standing and he would lose his customers. His workers became imbued with the spirit of the enterprise and took a personal interest in the equipment they turned out. A very close relationship between management and labor has existed from the very beginning of the company.

With a coordinated team consisting of a strong engineering department and an experienced production department, Kahn was fully prepared when World War II developed. As a recognized electronics manufacturer, he immediately received substantial orders from various armed services. However, he did one thing that many other manufacturers later wished they had done too; he resisted the temptation

*See SIGNAL, Nov.-Dec. 1950, pgs. 12-13.

Special custom built 25 watt radio telephone 50 watt telegraph, two band intermediate frequency mobile transmitter as furnished the U. S. Department of Justice for use by the Imigration Border Patrol.



and the opportunity to expand X times. His reasoning was simple. Much of the equipment ordered by the government was like the equipment he had been producing right along for civilian purposes. The big difference was that it now meant life or death for American military personnel. Why lower standards at this time? If anything, why not raise them, in view of the higher stakes involved? So TEMCO remained in its compact, highly efficient factory at 345 Hudson Street, in downtown

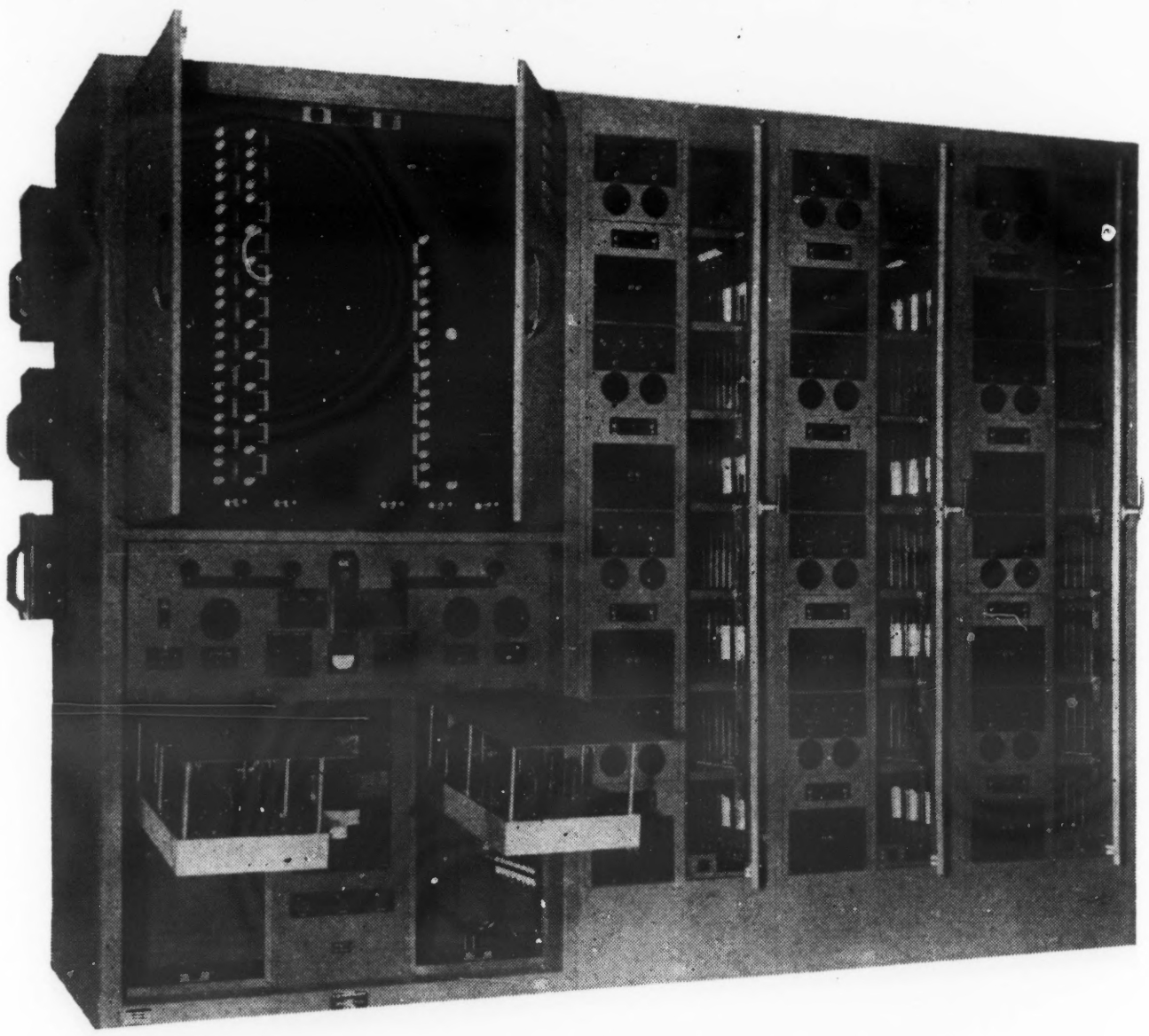
TEMCO's Mort Kahn and staff.

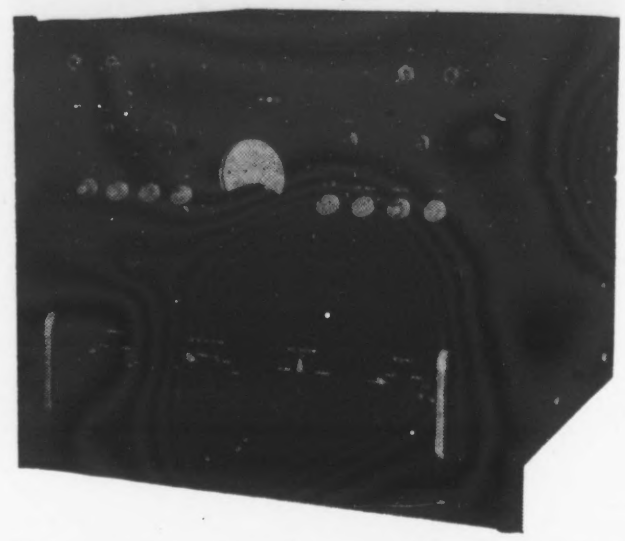
New York, and met its commitments by crowding in about 350 workers per shift instead of the usual 100 or 150, and giving them intensive training and indoctrination for their jobs.

The engineering and production experience that TEMCO had acquired in peace time enabled the organization to undertake and solve some highly advanced military electronic problems for which there was no previous background in ordinary communications practice. At a time when the mere word "radar" was classified information and was mentioned only in hushed tones, the company made radar gunfire control systems, airborne microwave radar receivers and a large quantity of new radar test equipment. It manufactured guided-missile controls, electronic computers, differential analyzers, low altitude radar bomber trainer units, servo amplifiers, blind landing instruments and similar devices that had never existed before. The transmitters for which TEMCO was already famous were not overlooked by the armed services and large numbers of them came off the production line. However, the bulk of Kahn's war time business was represented by special equipment that was built up from scratch. Among the users of these products, in addition to the Army, Navy and Air Force, were the Treasury Department, the Office of Strategic Services (the "OSS"), the Office of War Information (the "OWI") and the Columbia Medical Center. For the last named, TEMCO provided some unusual electronic equipment for an unusual project dealing with the treatment of head injuries.

With its vastly enlarged "know-how," TEMCO continued to handle prime and subcontracts after the war and swung smoothly into the accelerated program that followed the Korean outbreak. Its current achievement, which is exciting much interest among all the communications services, is the SAMSON, an electronic device that provides positive synchronization of teletype and cryptographic machines on either radio or

Front open view of TEMCO model 757 AZ 24 position cathode ray life test rack illustrating pulse generators, amplifiers, high voltage bleeder resistors and interior of cathode ray positions.





Reproduction prototype model of Samson Cryptographic synchronizing Unit developed and designed in accordance with JAN specications for USA by TEMCO for use with radio teletype system.

wire circuits. Presented only with the general requirements for such equipment by the Air Force, TEMCO's chief engineer, Gerald W. Jacob, went into a huddle with his staff and came up with a working model in the record breaking time of six weeks. In a dramatic demonstration before surprised Air Force officials who hadn't expected such fast action, the model kept the associated conditions of operation. Even after a "rest" of almost two hours, the cold system picked up instantly without losing a transmitted character.

One SAMSON does the work of two previous units, costs less and is easier to install, operate and maintain. The device incorporates some new concepts in electronic circuit design, patents on which are being taken out by the government.

The Air Force expressed its appreciation for TEMCO's unprecedented handling of the SAMSON project by placing an immediate order for two million dollars worth of the units. The company is not only manufacturing the equipment, but it is also training Air Force personnel in its use and servicing in a school set up in the factory. Major General F. L. Ankenbrandt, then director of communications of the USAF, followed up with a warm letter of recommendation.

TEMCO's long experience with transmitters came to the foreground when the firm recently made some notable improvements in the AN/TRC-1 and AN/TRC-3, popularly known in the Army as the "Antrack."

As a result, it is now producing for the Signal Corps, several million dollars worth of this highly useful transmitter. Additionally, the company is making test sets for checking germanium crystals, radar and radio communication components and assemblies, frequency meters, power supplies, etc.

Chief Engineer Gerald W. Jacob, whose work on the SAMSON and other important equipments has earned him wide praise, was a civilian employee of the United States Army in China, during World War II, in charge of maintenance of several high power radio

(*Continued on page* 80)

"Baby-san"

The poignant story of the little Korean orphan, "Baby-San," and her "adoption" by Lt. William Doernbach, signal officer of the 3rd Infantry Division, has been published widely. We bring the story to the attention of our readers, because there is an especial interest in it for us, in that Lt. Doernbach is a member of the AFCA.

It was tough for Lieutenant William Doernbach to give up his "adopted" Korean child, but they're both happy now.

After three attempts at parting, "Baby-san," a six-year-old girl, is now fairly content at Taegu's Protestant orphanage. And Doernbach is satisfied to know she's re-receiving good treatment.

The lieutenant, a 3d Division signal officer from Egg Harbor, N. J., and Baby-san fell for each other the minute they met on a street in Suwon last April.

In the beginning, their story paralleled that of a thousand other Americans who have taken homeless waifs into their custody.

Doernbach recalls when he first picked her up, she was dirty and ragged.

"I told her I didn't want to see her dirty the next morning," he said, "but she simply shrugged and told me, 'Soap hava no'."

So he furnished her with soap and a brush and she got down to business. She stripped, washed her clothes and put them back on —not minding that they were still wringing wet. "And she scrubbed her feet until they bled," Doernbach remembered.

Everything was going fine with them until several weeks later, when it became evident that Baby-san didn't fit into the military picture. She had to go.

Hard as it was, the lieutenant took her to an agency in Seoul which promised to look after her.

But at this point, their story changed from the ordinary.

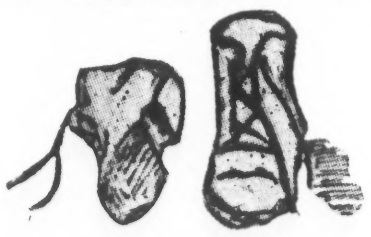
Baby-san wasn't satisfied. She missed Doernbach and decided to go back to him. She got "over the hill" without any trouble, and worked her way to his headquarters, on the edge of the city.

"I hated to take her back, but I had to," he said. "I knew it would be best in the end."

Against both their wills, he did take her back. But she was determined. She skipped out and came back to him once more.

The next day Doernbach thought he had found an answer to the problem. He heard of a mass party called "Operation Mascot," where children formerly "adopted" by various Army units were being taken in by the Taegu orphanage.

They arrived late at the party, but Doernbach saw what was happening—all the children seemed happy with the affair. They were too busy with the gifts and games to be worried about leaving their benefactors.



Not so with Baby-san, it turned out. She took part in the activities, but stuffed her shoes into Doernbach's pockets before doing so—to make sure he wouldn't leave her.

But the time to leave finally came, and again Baby-san didn't like it. As she clung to Doernbach, crying and trying to stop his departure, newsmen's cameras caught the scene. For a few days she was the most popular Korean child in the United States.

But today the story has ended, happily. After a few weeks the little girl began to like her new home. Lieutenant Doernbach traveled to Taegu to visit her, and gave her a complete new set of clothes—stateside shoes, a dress and stockings.

"She seemed glad to see me," he said,"and parting was not the problem it had been before."

From The President

President Halligan in this message stresses the importance of AFCA in the national picture under present world conditions. By promoting harmonious relations between military and industrial men, by continuing to inspire and stimulate American ingenuity, AFCA can make an invaluable contribution to America's strength.

It has by now certainly been painfully shown to the world that there will be no rest for the weary in the matter of any secure and peaceful relationship between our country and the U.S.S.R. Whether we are to have an all-out war or will continue "as skirmishers"—whether we will have to build to an armed force of five million men and remain poised for years to come with striking forces necessary to cope with any outburst—these things are matters for conjecture. We know, though, that there is no road back. We know that we must perfect our planes, our ships, or guns and by no means the least—our communications, electronic, and photographic equipment.

It seems to me, then, that we cannot emphasize too strongly the need for such an organization as AFCA—world conditions being what they are and military applications of certain equipments being so vital a matter. Through the medium of our association, military and industrial men have come to know and understand each other's problems. The AFCA provides a common ground on which ideas and suggestions are exchanged—a relationship which for six years has been very successfully demonstrated.

At the risk of seeming repetitious I want to re-state a portion of the Preamble of the AFCA Constitution: "The Armed Forces Communications Association. . . . .is a national society of American citizens working toward national security in the fields of communications, electronics, and photography. . . The principle objective of the Association is an active membership. . .to whom the responsibility of training, production, maintenance and operation of this type of equipment falls in time of peace as well as time of war."

You members of the AFCA can feel proud that your organization is today serving as one of the prime instruments for bringing industry and the services together. AFCA through its regional and national meetings is demonstrating to the highest degree a good harmonious relationship leading to earlier and better decisions on matters of vital interest to our country.

The factor of "know how"—America's greatest strength—is more flexibly available through organizations like the AFCA. I urge all of our members, both group and individual, to get behind the AFCA to the end that it can continue in its role of inspiring and stimulating American ingenuity. In this way, whatever the course of world affairs, the United States of America will continue to hold its commanding position.

W. J. Halligan

ASSOCIATION AFFAIRS

COMMUNICATIONS • ELECTRONICS • PHOTOGRAPHY

ARMED FORCES COMMUNICATIONS ASSOCIATION

1624 Eye Street, NW
Washington 6, D. C.
Phone: EXecutive 6991

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Frederick R. Lack*
Theodore S. Gary*

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William J. Halligan*

1st Vice-President
Rear Adm. Earl E. Stone, USN

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1952

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Maj. Gen. F. H. Lanahan, USA
David Sarnoff
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1953

Maj. Gen. F. L. Ankenbrandt, USAF*
C. O. Bickelhaupt
J. R. Cunningham
Walter Evans
T. F. Halloran
Thomas J. Hargrave
Oliver Read
Rear Adm. E. E. Stone, USN

1954

George W. Bailey*
Percy Black
Wm. H. Mansfield
A. W. Marriner
G. F. Metcalf
Edward M. Webster
G. C. Whitaker
Joseph C. Wilson*

1955

Vernon Bagnall
Roland C. Davies
W. J. Halligan*
David R. Hull
William Kahler
Frederick R. Lack*
Maj. Gen. K. B. Lawton
Ellery W. Stone

**Executive Committee Member*
†Executive Committee Member, non-voting

Another Director Leaves

One more director will be missing from AFCA board meetings with the departure of Major General Francis L. Ankenbrandt, USAF, for an assignment in Europe. General Ankenbrandt makes the third AFCA director to have left the States this year. Major General Francis H. Lanahan, SC, went to a new post in Europe last April, and Rear Admiral Earl E. Stone, USN, took over a sea duty assignment in July.

Representing each of the major services, all three directors have been vigorous participants in AFCA affairs ever since the Association's inception, and they will be greatly missed from Stateside AFCA activities. But their demonstrated interest in AFCA goals presages the strengthening of the pursuit of those goals in whatever far locale they may happen to be.

General Lanahan is now chief signal officer in charge of all communications for SHAPE, and Admiral Stone's assignment is in a command capacity with the fleet in the Pacific. General Ankenbrandt, who just recently was nominated for the permanent rank of major general, left for Europe September 21 to begin new duties as assistant deputy chief of staff for communications of the Allied Air Forces in Europe.

Another staunch AFCA supporter, Colonel Henry J. Hort, was lost to Stateside AFCA activities with his transfer to the Far East Command. Col. Hort, who was commanding officer of the unit training group, Signal Corps Training Center, Camp Gordon, Ga., was chapter president of the AFCA Augusta-Camp Gordon Chapter in 1950, and in that year led the organization in its successful campaign for the title of "Chapter of the Year" in the Association's national annual contest. It can be regarded as certain that Col. Hort in his new assignment will be thoroughly active in the AFCA Far East Chapter.

Fechteler Made Honorary Member

The new Chief of Naval Operations, Admiral William M. Fechteler, has accented an honorary membership in the AFCA. Honorary membership in the Association is traditionally offered to the heads of the services.

25 New Group Members

Twenty-five new group members have been added during the late summer months to the list of industry backers of AFCA goals. Two of the new industry members are in California, one in New York, and the other twenty-two in the Chicago area. The enlistment of the latter, including the New York member, into the AFCA industry-military cooperative effort is the result of an intensive membership campaign by the Association's Chicago Chapter, the chapter's president, John R. Howland, and AFCA's national president, William J. Halligan who is president of the Chicago firm, The Hallicrafters Company.

The new AFCA industry members are:

Allied Radio Corp., Chicago
Altec Lansing Corp., Beverly Hills, Calif.
Bergsma Brothers, Grand Rapids, Mich.
Churchill Cabinet Company, Chicago
Drake Manufacturing Co., Chicago.
General Transformer Co., Homewood, Ill.
Guardian Electric Manufacturing Co., Chicago.
Hycon Manufacturing Co., Pasadena, Calif.
The James Knight Co., Sandwich, Ill.
Kester Solder Co., Chicago.
Lenz Electric Manufacturing Co., Chicago
The Muter Company, Chicago.
Pickering & Company, Oceanside, N. Y.
Pioneer Electric & Research Corp., Forest Park, Ill.
Utah Radio Products Co., Inc., Huntington, Ind.
J. P. Seeburg Corp., Chicago.
Shure Brothers, Chicago
Shoup Engineering Co., Chicago.
Standard Coil Products Co., Inc., Chicago.
Standard Transformer Corp., Chicago
Stewart-Warner Corporation, Chicago.
Telegraph Apparatus Co., Inc., Chicago.
Wells Sales Inc., Chicago
Zenith Radio Corporation, Chicago.

April in
Philadelphia
AFCA in
Philadelphia
1952 meeting in
Philadelphia
Plan to be there in
Philadelphia
April 24, 25, 26, 1952

AFCA GROUP MEMBERS

Communications—Electronics—Photography

Listed below are the firms who are group members of the Armed Forces Communications Association. By their membership they indicate their readiness for their share in industry's part in national security. Each firm nominates several of its key employees or officials for individual membership in AFCA, thus forming a group of the highest trained men in the electronics and photographic fields, available for advice and assistance to the armed services on research, development, manufacturing, procurement, and operation.

Acme Telectronix
Allied Radio Corporation
Altec Lansing Corporation
American Cable & Radio Corp.
American Institute of Electrical Engineers
American Phenolic Corporation
American Radio Institute, Inc.
American Radio Relay League
American Steel & Wire Company
American Telephone & Telegraph Co.
Anaconda Wire & Cable Company
Argus Cameras, Inc.
Arnold Engineering Company
Astatic Corporation
Automatic Electric Company
Automatic Electric Sales Corp.
Baltimore News Post
Barry Corporation, The
Bell Telephone Company of Pa.
Bendix Radio
Bergsma Brothers
Bliley Electric Company
Breeze Corporation, Inc.
Burnell & Company
California Water & Telephone Co.
Capitol Radio Engineering Inst., Inc.
Carolina Telephone & Telegraph Co.
Central Radio and Television Schools
Chesapeake & Potomac Tel. Co.
Cincinnati & Suburban Bell Tel. Co.
Collins Radio Company
Columbus Process Co., Inc.
Copperweld Steel Company
Cornell-Dubilier Electric Corp.
Corning Glass Works
Coyne Electric School, Inc.
Da-Lite Screen Co., Inc.
Diamond State Telephone Co.
Drake Manufacturing Co.
DuMont, Allen B., Laboratories, Inc.
Eastman Kodak Company
Eby, Inc., Hugh H.
Electronic Associates, Inc.
Espey Manufacturing Co., Inc.
Federal Mfg. and Engineering Corp.
Federal Telephone & Radio Corp.
General Aniline & Film Corp.
General Cable Corporation
General Electric Company
General Insulated Wire Works, Inc.
General Instrument Corp.
General Telephone Corp.
General Transformer Co.
Gilfillan Bros., Inc.
Graflex, Inc.
Gray Manufacturing Co.
Guardian Electric Mfg Co.
Hallicrafters Company
Haloid Company
Hazeltine Electronics Corp.
Heinemann Electric Company
Hercules Motors Corp.
Hoffman Radio Corp.
Hycon Manufacturing Company
Ilex Optical Co.
Illinois Bell Telephone Co.
Indiana Bell Telephone Co.
Indiana Steel & Wire Co.
Indiana Steel Products Co.
Institute of Radio Engineers
International Resistance Co.
International Tel. & Tel. Corp.
Jacobsen Manufacturing Co.
James Knights Co., The
Kellogg Switchboard & Supply Co.
Kester Solder Company
Kleinschmidt Laboratories, Inc.
Lavoie Laboratories
Leich Sales Corporation
Lenkurt Electric Company, Inc.
Lewyt Corporation
Loral Electronics Corporation
Machlett Laboratories, Inc.
Magnavox Company
Mallory & Co., Inc., P.R.
Martin, Glenn L., Company
Merit Transformer Corp.
Michigan Bell Telephone Company
Motorola, Inc.
Mountain States Tel. & Tel. Co.
Muter Company, The
National Company, Inc.
New England Tel. & Tel. Co.
New Jersey Bell Telephone Company
New York Telephone Company
Northwestern Bell Telephone Co.
Oak Manufacturing Co.
Ohio Bell Telephone Co.
O'Keefe & Merritt Company
Operadio Manufacturing Company
Pacific Telephone & Telegraph Co.
Philco Corporation
Photographic Society of America
Pioneer Electric & Research Co., The
Precision Apparatus Co., Inc.
Radiart Corporation
Radio Condenser Company
Radio Corporation of America
RCA Victor Division
Ray-O-Vac Company
Raytheon Manufacturing Company
Reeves Instrument Corp.
Remington Rand, Inc.
Saxonburg Potteries
Seeburg, J. B., Corporation
Sherron Electronics Co.
Shoup Engineering Company
Simmon Brothers, Inc.
Society of Motion Picture Engineers
Sonotone Corporation
Southern Bell Tel. & Tel. Co.
Southern New England Tel. Co.
Southwestern Bell Telephone Co.
Sperry Gyroscope Company
Sprague Electric Company
Stackpole Carbon Company
Standard Coil Products Co., Inc.
Stewart-Warner Corporation
Stupakoff Ceramic & Mfg. Co.
Sylvania Electric Products, Inc.
Telegraph Apparatus Co., Inc.
Telephone Services, Inc.
Telephonics Corporation
Teletype Corporation
Times Facsimile Corporation
Transmitter Equipment Mfg. Co.
Tung-Sol Lamp Works, Inc.
United Radio Television Institute
United States Rubber Company
United Telephone Co.
Utah Radio Products Co., Inc.
Webster-Chicago Corporation
West Coast Telephone Co.
Western Electric Company, Inc.
Western Union Telegraph Co.
Westinghouse Electric Corp.
Weston Electrical Instrument Corp.
Willard Storage Battery Company
Wisconsin Telephone Company
Wollensak Optical Company
Zenith Radio Corporation

Gold Medal Awards

Chapters Getting Set For New Season

While the summer is an off season for AFCA chapter meetings and other activities, the summer months saw several chapters making intensive bids for the Association gold medal award offered to the member in each chapter bringing in the greatest number of new members during July and August. Notable among these efforts is that of Robert J. "Snuffy" Smith, a vice president of the Atlanta Chapter. Early in the summer "Snuffy" announced himself as being "on the warpath" for members, and if the results of his exertions in earlier membership campaigns are any gauge, it is certain that he will be a winner in this one.

The Kentucky Chapter has also been reporting exceptional activity in membership campaigning, and is working toward the gold medal award.

Several of the chapters have been reporting excellent programs lined up for the coming 1951-52 winter season. Outstanding among these is the program lined up by the Detroit Chapter together with the University of Michigan. The Washington, D. C. Chapter has also outlined its program, aiming at the continuation of the highly successful meetings held last season at the National Press Club.

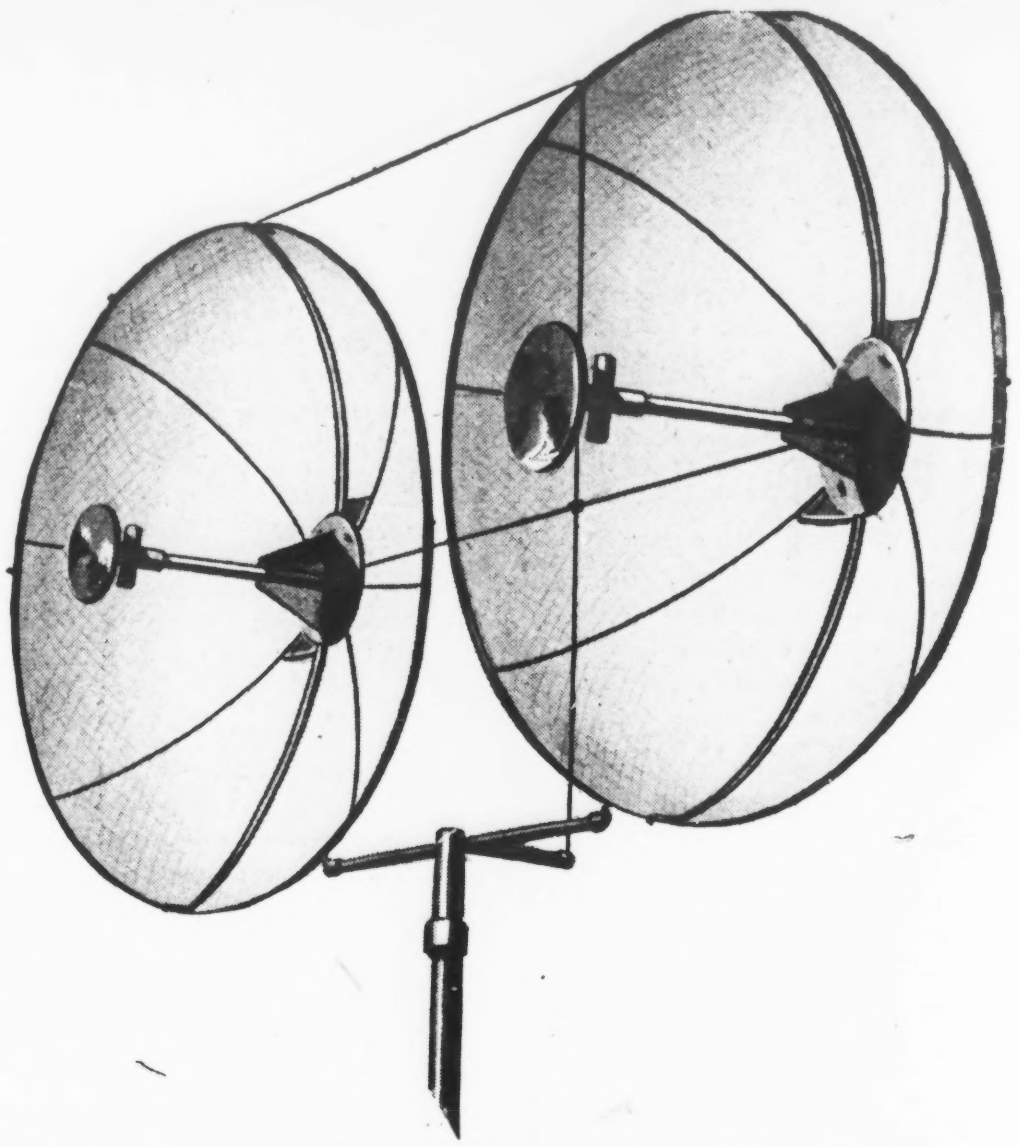
Strieby Replaces Perrine

Dr. James O. Perrine, familiar figure in the past to many AFCA chapters as a lecturer-demonstrator, has retired from the American Telephone & Telegraph Co. to become associated in a consultative capacity with the Signal School at Fort Monmouth, N. J., and has been replaced at AT&T by Mr. M. E. Strieby.

Dr. Perrine, who was an assistant vice-president of AT&T, was an officer with the Signal Corps during World War I. He joined AT&T in 1921 following several years on the engineering faculty of Yale University. He represented his company at the World's Congress of Telephone Engineers and World's Congress of Physicists in 1927. In 1928 and 1930 he gave the de Forest lecture in communications at Sheffield Scientific School, Yale, and in 1946 presented the Richard B. Westbrook series of lectures at Wagner Institute of Science in Philadelphia. In his highly popular lectures at AFCA chapters, Dr. Perrine demonstrated and described equipment used in the transmission of voice by wire and radio.

AFCA chapters who may wish to arrange for a lecture visit by Mr. Strieby can reach him as follows: Mr. M. E. Strieby, c/o John M. Shaw, assistant vice president, American Telephone & Telegraph Co., Room 536, 195 Broadway, New York 7, N. Y.

You can't cut a MICROWAVE!



As every signalman knows, no field problem can match —for headaches—the job of playing nursemaid to ground wire. Pounded by trucks and tanks, ripped by bulldozers, and shattered by artillery, signal cable is also target "A" for enemy patrols and saboteurs. Keeping tactical communications open has always been costly in manpower, materiel, and transportation.

Working with Signal Corps engineers, General Electric has improved upon basic microwave designs to combine the best features of many. The new ANTRAC 26* is a radio transmitter—receiver and multiplex unit providing eight 2-way voice channels. Built for fixed or truck mounting, it is compact, durable, capable of operating in any weather, over any terrain. Designed as a connecting link in a communication network where laying wire is not feasible, this unit embodies the microwave point-to-point line-of-sight principle. It is one of many new military developments from Electronics Park where microwave systems are a specialty. Here, in the electronics capital of the world, General Electric's aim is to replace muscle with machinery—to make electronics provide us with a vital edge of superiority.

*AN/TRC-26

You can put your confidence in—

GENERAL ELECTRIC

CHAPTER NEWS

Atlanta

A one-man membership drive at the Atlanta General Depot has resulted in a sizable increase in the total chapter strength. The committee of one is Robert J. (Snuffy) Smith, a vice-president of the chapter, who is out to win the gold medal offered by national headquarters to the member in each chapter bringing in the greatest number of new members during the months of July, and August. Snuffy's success as a recruiting officer is due to his enthusiastic interest in the association and its objectives.

Augusta-Camp Gordon

The Camp Gordon Radio Club was the scene of the chapter's midsummer meeting on July 27th. Capt. John A. Ritner, club custodian, conducted the chapter members on a complete tour of the club and its facilities. Six transmitters were in action simultaneously and several members availed themselves of the opportunity to send messages to friends around the country through the courtesy of the club.

The business portion of the meeting revolved around the July-August membership contest sponsored by national headquarters. Since the chapter was not holding another meeting until September, it was voted to extend the contest within the chapter into that month.

Two of the sound films made available to all AFCA chapters by the Westinghouse Electrical Corporation, "Electronics at Work" and "Electrical Proving Ground," concluded the evening's program. The audience felt that the latter film, especially, which presents in Kodachrome the story of twenty-five years of switchgear testing in the Westinghouse High Power Laboratory, was of great technical interest.

Boston

A number of unique developments in high speed photography were described at the June 21st chapter meeting by Charles W. Wyckoff of the Massachusetts Institute of Technology.

Annual elections were held with President Tom Halloran, General Communication Co., Secretary Mark T. Muller, Asst. PMS&T, MIT, and Treasurer Gardiner Greene, Workshop, retained in office for a second term. Other officers chosen were: vice-presidents—David R. Hull, Raytheon Manufacturing Co.; Col. J. J. Kendry, USA (Ret.); executive committee—Capt. A. R. Taylor, USN; B. K. Thorogood, Franklin Technical Institute; Edward A. Johnson, The Barry Corp.; A. S. Mullins, New York Central Railroad Co.

Chicago

The first fall meeting is scheduled for September 27th and promises to be an outstanding event. Bill Halligan, national president of AFCA and president of Hallicrafters Company, will be host at the Hallicrafters plant. The program calls for authoritative speakers from the Signal Corps and the Illinois Institute of Technology and a comprehensive tour of the Hallicrafters plant.

A drive for additional group memberships is being conducted under the leadership of D. B. Miller, chairman of the membership committee.

Cleveland

The entire slate of chapter officers was re-elected for another term. Continuing as president is Lee J. Shaffer of the Ohio Bell Telephone Company; vice-presidents are: V. G. Krebs, National Advisory Committee for Aeronautics; W. McClusky, Citizens Telephone Company; secretary—T. F. Peterson, American Steel & Wire Company; treasurer—G. F. Prideaux, General Electric; member executive committee—C. H. Endress, Willard Storage Battery Co.

Detroit

"Raydist," a new electronic device for mapping of coastal areas, was demonstrated before the Greater Detroit Chapter on May 23rd. This latest development in the field of electronic positioning was exhibited by the United States Lake Survey, Corps of Engineers, U.S.A., on its lake survey motorship *Williams*.

The Lake Survey has been a pioneer in developing and adapting new discoveries to the mission of charting the Great Lakes, in which the organization has been engaged since the charting project was authorized by Congress 110 years ago. Developments in electronic positioning during and since World War II have provided excellent means for increasing the speed and accuracy with which hydrographic surveys can be made. Lake Survey, under the direction of Major William N. Harris, district engineer, serves as an experimental agency in this regard for the Great Lakes Division.

Mr. Andrew Hacskaylo of the development staff of the Hastings Instrument Company of Hampton. Va., which manufactures "Raydist," was present to describe the basic principles of the system and to display the equipment which had been installed on the *Williams* for experiment and use in connection with surveys to be conducted during the present field season. He explained how, with the various transmitting and relay units properly placed on shore control points, it is possible on board the *Williams* to track precisely and plot on a chart the course which the vessel is following even though the visibility may be zero. The position of the vessel is known at any moment within a very few feet.

In order that the new equipment may be tested and used most effectively there will be installed presently on the *Williams* the latest type marine radar manufactured by the Radiomarine Corporation of America. "Raydist" will show the position of the *Williams* and radar will show the positions of other vessels in the area to guard against collision during periods of reduced visibility. Through arrangements made by the Radiomarine Corporation of America, a lake freighter with an installation of marine radar, was docked at the slip adjoining the *Williams* for the inspection of the chapter. Features of the Radiomarine radar were explained and the use of the equipment demonstrated by Mr. G. P. Shandy, general manager of the Radiomarine Corporation in the Great Lakes region.

Following dinner at Schweizer's Restaurant, the AFCA members and guests assembled at the U. S. Engineers' dock at 7:30 P.M. Mr. William T. Laidly of the Corps of Engineers acted as host on behalf of Major Harris who was out of the city.

Program plans for the coming year call for four meetings to be held with the cooperation of the University of Michigan on atomic energy. The subject will be treated progressively along these lines: first meeting—theory; second meeting—research; third—application to medicine; fourth—application

Chapter of the Year, 1951

SACRAMENTO

President—Paul W. Carrington
Past Pres.—Milton G. Mauer
Secretary—C. A. House

1952 Contest — Chapter of the Year

On August 31st, the first five months of the contest showed the following chapter line-up:

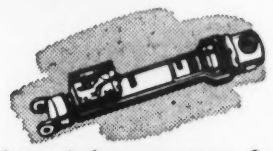
	Points		Points
Gulf Coast	9.44	San Francisco	5.85
Chicago	6.91	Philadelphia	5.67
Cleveland	6.48	Detroit	5.43
New York	6.13	Seattle	5.05
Boston	5.97	Pittsburgh	4.81

The remaining seven months of the contest are usually the most active. Many chapters adjourn for the summer and full-scale activities are resumed in the fall. Therefore, it is probable that numerous changes will take place in the above list before the contest comes to a close on March 31, 1952.

Connector Problem?

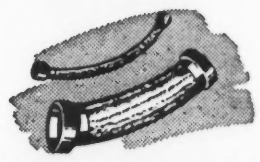
...We'll take it from HERE

Good ideas for electronic circuitry sometimes run afoul of connector problems. Maybe existing connector units won't hold air pressure gradients, won't stand the heat, aren't rugged enough for the job. Or maybe it's a question of altitude, or under-water application. But if you can sketch the circuit, we'll take it from there. We've engineered so many special connectors, solved so many "impossible" problems, that whatever the requirements are, we can usually provide the answer.



Lightweight actuators for any requirement.

Job engineered, welded-diaphragm bellows.



Flexible conduit and ignition assemblies.

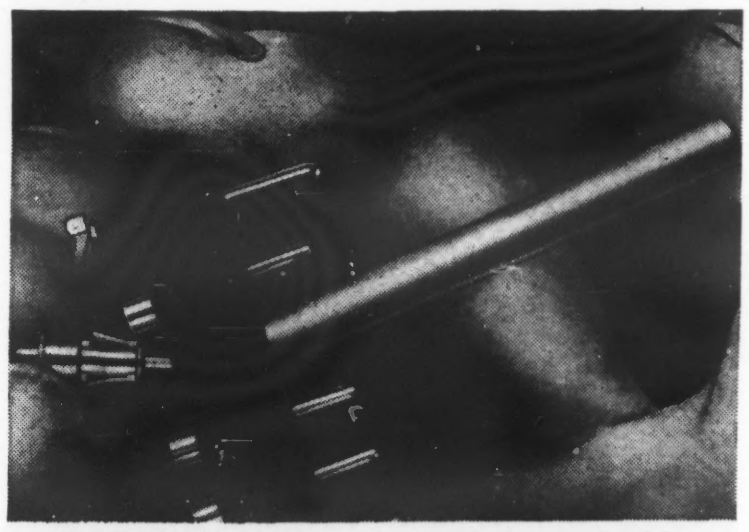
Aero-Seal vibration-proof hose clamps.

WRITE TODAY for specific information, or send us your sketches. We'll forward recommendations promptly.

BREEZE
Special CONNECTORS

BREEZE CORPORATIONS, INC.

41 South Sixth Street — Newark, New Jersey



Removable pins **in Breeze connectors speed soldering, save time, trouble. Pins snap back into block.**

National Director of Chapters: **W. W. Watts, RCA Victor Div., Camden, N. J.**

AREA REPRESENTATIVES FOR CHAPTERS

Area A: George W. Bailey, IRE, 1 E. 79th St., New York, N. Y. *New England States, New York, New Jersey*

Area B: J. H. LaBrum, Packard Building, Philadelphia, Pa. *Delaware, Kentucky, Maryland, Ohio, Pennsylvania, West Virginia and Virginia*

Area C: Ralph S. Grist, So. Bell T&T Co., Atlanta, Ga., *Southeastern States along Atlantic and Gulf coasts—from North Carolina to Louisiana including Tennessee*

Area D: E. H. Mittanck, 711 Telephone Bldg., Dallas, Tex. *New Mexico, Texas, Oklahoma, Arkansas*

Area E: T. S. Gary, 1033 W. Van Buren St., Chicago, Ill. *Michigan, Indiana, Illinois, Wisconsin, Minnesota, Iowa, Missouri, Kansas, Nebraska, North Dakota, South Dakota, Wyoming, Colorado*

Area F: H. L. Hoffman, 3761 S. Hill St., Los Angeles, Calif. *Arizona, Utah, Nevada, California, Idaho, Oregon, Montana and Washington*

CHAPTERS: PRESIDENTS AND SECRETARIES

ATLANTA: President—Col. Clyde R. Smith, SigC, 3rd Army, Ft. McPherson, Ga. Secretary—Collins L. Cochran, SigSec, Hqs 3rd Army, Ft. McPherson, Ga.

AUGUSTA-CAMP GORDON: President—Norman J. Kinley, 164 E. Hancock Dr., Augusta, Ga. Secretary — Leonard Carlson, SCTC, Camp Gordon, Ga.

BALTIMORE: President—Henry W. Williams, 3953 Cloverhill Rd., Baltimore, Md. Secretary—Donald C. Lee, Westinghouse Elec. Corp., 2519 Wilkens Ave., Baltimore, Md.

BOSTON: President—T. F. Halloran, General Communication Co., 530 Commonwealth Ave., Boston, Mass. Secretary — Mark T. Muller, Asst. PMS&T, M.I.T., Cambridge, Mass.

CHICAGO: President—John R. Howland, Stewart-Warner Corp., 1826 Diversey Phwy, Chicago, Ill. Secretary—Raymond K. Fried, 111 W. Monroe St., Chicago, Ill.

CLEVELAND: President — Lee J. Shaffer, 820 Superior Ave., N. W., Rm. 205, Cleveland, Ohio. Secretary—T. F. Peterson, American Steel & Wire Co., 1434 Union Commerce Bldg., Cleveland, Ohio.

DALLAS: Acting President— E. H. Mittanck, 711 Telephone Bldg., Dallas, Tex.

DAYTON-WRIGHT: Acting President—Steve J. Gadler, 1524 Gummer, Dayton, Ohio.

DECATUR: President—Robert J. Bangert, 1110 Albert St., Decatur, Ill. Secretary—O. D. Allinson, 340 S. 23rd St., Decatur, Ill.

EUROPEAN: President — I. P. Doctor, SigO, Frankfurt Mil. Post, APO 757, New York. Secretary—C. E. Laurendine, Comm. Gp., Bi-Partite Control Office, APO 757, New York.

FAR EAST: Acting President—Brig. Gen. Elton F. Hammond, SigSec, GHQ, FEC, APO 500, San Francisco.

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GULF COAST: President—John A. McDavid, 3380th TT Gp., Keesler AFB, Miss. Secretary—Richard B. Deane, 1053½ W. Howard, Biloxi, Miss.

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UNIVERSITY OF ILLINOIS: Urbana, Ill. President—Donald A. Jackson; Secretary—Milton F. Langer.

UTAH STATE AGRICULTURAL COLLEGE: Logan, Utah.

National Headquarters Chapters Secretary: Julia B. Godfrey

CHAPTER NEWS

to industry. The intervening bi-monthly meetings will be devoted to communications and photography, with the annual business meeting scheduled for April.

Far East

The Far East Chapter, with the cooperation of the three services, is making plans to resume its activities and those of its posts under the sponsorship of Brig. Gen. Elton Hammond, the new signal officer, FECOM.

The last meeting of the Okinawa Post took place in July 1950 when it was decided to discontinue activity during the Korean emergency. Officers of the post and committee chairmen are now preparing to reactivate the unit. Post officers are: president—Col. J. T. Wrean; vice-president — Maj. C. F. Himes; secretary—Capt. W. A. Becklund; treasurer—Sgt. C. A. Tice; program committee: Maj. C. F. Himes, Capt. W. H. Oakley, Lt. R. F. Myers; public information officer—M/Sgt. J. F. Landis; membership committee—Sgt. C. A. Tice.

President of the Philippine Post is Maj. Henry B. Holmes, III, who reports that a meeting is being scheduled to discuss ways and means of stimulating interest in association affairs.

The Yokohama and Tokyo Posts are also expected to be reactivated in the near future.

Fort Monmouth

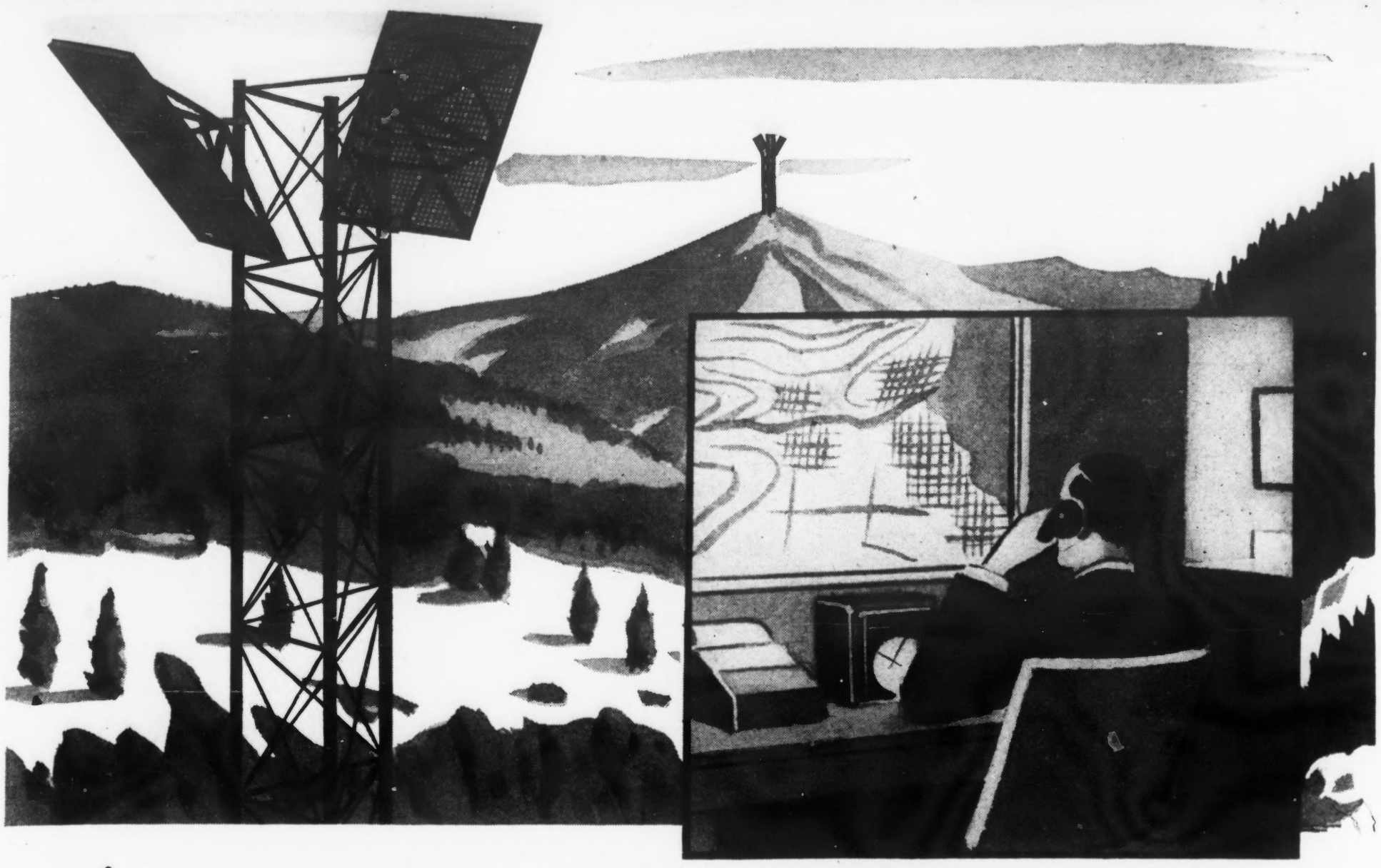
The chapter has lost an able secretary through the transfer of Lt. Col. Mervin C. Bowers to the Naval War College in Newport, R. I. Lt. Col. Ernest E. Knight has been appointed his successor.

A membership drive has been under way at Fort Monmouth throughout the summer months and regular chapter meetings will be resumed in October.

Gulf Coast

Mr. Hal Falter, general manager of the local radio station WVMI, was guest speaker at the chapter's regular monthly meeting on July 13th. He discussed the importance of radio to the general public and pointed out its far-reaching effects upon daily life. He also related some of the behind-the-scenes humor which goes on in a radio station.

At the business portion of the meeting, Capt. R. P. Deane was elected chapter secretary to succeed Maj. Lloyd E. Sunderland who had been trans-



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ferred to Europe. In announcing Major Sunderland's transfer, Colonel John McDavid, chapter president, commended him for his outstanding work as the chapter's first secretary. Captains T. G. Cline and G. F. Classic were appointed to serve on the program committee.

Dinner with all the trimmings—music and entertainment—preceded the meeting at the Markham Hotel.

Kentucky

The Kentucky Chapter, inactive since last year when the Lexington Signal Depot went on a three-shift schedule which made it difficult to arrange regular meetings, returned to the active roll in August. A re-organization meeting was held at the depot on August 27th, to be followed by another meeting on September 15th. Arrangements are being made for an outstanding affair on September 28th at which the principal speaker will be Brig. General Eugene V. Elder, chief of the procurement and distribution division of the Office of the Chief Signal Officer.

Acting President Harry Bradshaw and Secretary Clyde Burke have announced that the chapter's hat is again in the ring for the Chapter of the Year title, with an anticipated membership increase of 300%. The chapter won the 1949 contest with the greatest number of points earned in the history of the contest. The reactivation of the chapter was brought about by Col. Harold T. Gallagher, commanding officer of the Lexington Signal Depot and a charter member of the AFCA.

Louisiana

Plans point toward a successful reorganization of the chapter in the early fall. Chapter Secretary Bruce Hay, of the Southern Bell Telephone and Telegraph Co., New Orleans, is sparking the re-activation and reports considerable progress has been made in stimulating interest in the chapter.

New York

The Coast Guard will be host to the chapter's first fall meeting on September 19th at the New York Naval Shipyard, Brooklyn.

Rear Admiral Louis B. Olson, USCG, commander Eastern Area and commander Third Coast Guard District, is scheduled as the feature speaker, with "Search and Rescue and its Dependence on Communications" as his subject.

San Francisco

An excellent picture of West Coast Naval communications was presented to members attending the July 26th meeting of the San Francisco Chapter.

With the Navy as host, the meeting took place at the commissioned officers' mess, Treasure Island. Capt. C. C. Ray, USN, district communications officer, 12th Naval District, described communications in the 12th Naval District, and Capt. J. L. Melgaard, USN, communications officer, Western Sea Frontier, followed with some of the highlights of a recent inspection trip to the Jim Creek naval radio station at Arlington, Washington.

The group then adjourned to headquarters 12th Naval District, Federal Building, San Francisco, for a complete tour of the installations at the communications center.

Seattle

Mr. Russell Montler, head technician in Seattle for the Packard Bell Company, with the assistance of Lee David, chapter vice president and program chairman, gave a lecture-demonstration of the latest model Packard Bell television chassis. An interesting question and answer period followed the demonstration.

The evening's program concluded with a film, "Pattern of Survival," provided through the courtesy of the Standard Oil Company, which illustrated the procedures to be followed by individuals in case of an atomic attack.

Bob Waters of the Farwest Trading Company was appointed program chairman for the next meeting scheduled for September 12th. It is the chapter's custom to appoint a program chairman for each meeting.

The meeting was presided over by Chapter President Marshall James. A number of guests attending for the first time were introduced by Membership Chairman Frank Keyser.

F. E. Warren-Cheyenne

The first meeting of AFCA's newest unit took place at the Hospitality House, Cheyenne, on August 9th with forty-one members and guests in attendance.

After outlining the aims and purposes of the association to the new members present, the evening was devoted to plans for the effective operation of the chapter. A nominating committee was appointed to present a slate of officers for the first regular election; an entertainment committee was selected and plans were made for a dinner meeting the last week in September.

Two movies on communications were shown at the close of the meeting.

Washington

Under the leadership of Chapter President Percy Black of Automatic Electric Company plans are being made for a series of excellent meetings during the coming year. Major General Raymond C. Maude, the new director of communications, USAF, is slated to be the keynote speaker at the chapter's first meeting this fall.

Preston F. Shivers, Washington sales manager of Philco Corporation, has been appointed program chairman for the 1951-52 season.

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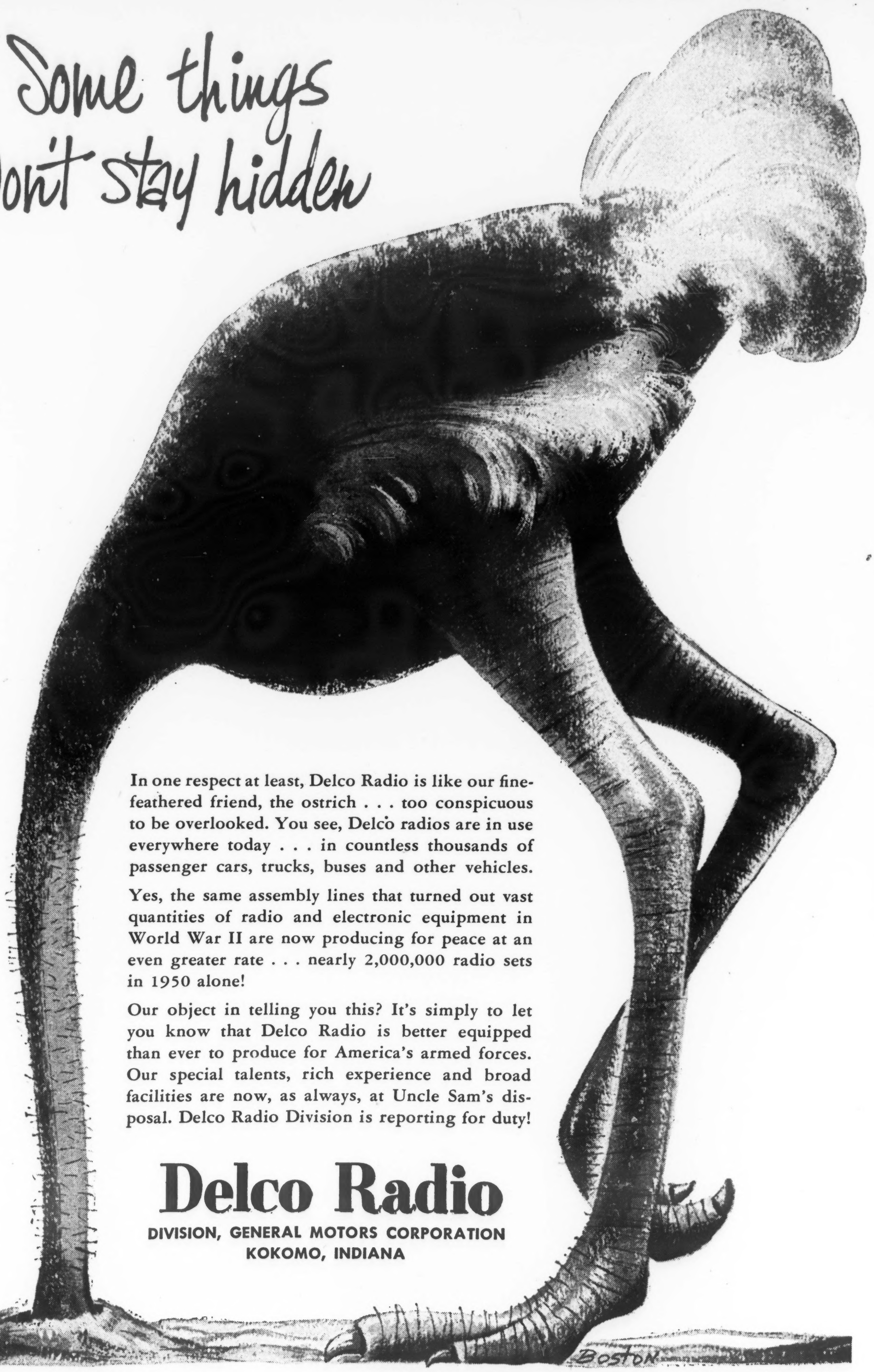

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SIGNAL NEWS

Communications-Electronics-Photography

Redman New Director, Communications-Electronics, JCS

McClelland Goes to CIA; Maude Succeeds Ankenbrandt; Goulett Heads Navy Communications; Smith Retiring, Garland Heads AACS

Rear Admiral John R. Redman, USN, director of Naval communications since Aug. '49, in mid-August became the new director of communications-electronics for the Joint Chiefs of Staff, succeeding Major General Harold M. McClelland, USAF, who held the post initially since it was set up in 1949, and who now has gone to an important assignment as one of the assistant directors of the Central Intelligence Agency under General Walter B. Smith.

In another top level change in military communications, Major General Francis L. Ankenbrandt, USAF, left for Europe September 21 to begin his new assignment as assistant deputy chief of staff for communications under Lt. General Lauris Norstad, commander-in-chief of the Allied Air Forces in Ceneral Europe. The new director of Air Force communications, which General Ankenbrandt had headed for five years, is Major General Raymond C. Maude, USAF, who has a notable record in Air Force and Army Air Corps communications, especially during World War II with three major military aviation communications commands, including two years as communications officer of the U. S. Air Forces in Europe.

Captain Wilfred B. Goulett, USN, has succeeded Admiral Redman as director of Naval communications. Captain Goulett had been serving as assistant director since last February, and previously for six months had headed the Navy's communications operations and planning branch.

In another important military communications assignment, Brigadier General E. Blair Garland returned to Washington August 16 from his command of the 1807th Airways and Air Communications Service Wing at Wiesbaden, Germany, to assume again the post of deputy director of the AACS of the Military Air Transport Service. It was regarded that this move presaged the appointment of General Garland as director of AACS upon the retirement of the present director, Brigadier General Wallace G. Smith, in October.

August also saw several top level personnel changes in the Signal Corps. Brigadier General Wesley T. Guest went to Korea to take over the post of Eighth Army chief signal officer, replacing Colonel Emil Lenzer who returned to Washington for assignment in General Guest's previous post as director of the plans and operations division, Office of the Chief Signal Officer. General Guest, in his new assignment, returns to familiar territory, having served as deputy chief signal officer in the Far East under General Akin. Earlier in World War II he served as director of communications, communications zone, European Theater of Operations. During that war Colonel Lenzer also held several important signal assignments, among them signal officer, services of supply, western task force; assistant signal officer, African Force Headquarters, and signal officer, Sixth Army Group.

O'Connell On Special Assignment

Brig. Gen. James D. O'Connell has been appointed to a special assignment group for boards and committees in OCSigO. It is understood that the assignment was on a temporary basis preparatory to Gen. O'Connell's appointment in the near future to a post of even greater responsibility. Gen. O'Connell is being replaced in his previous post as signal officer, Second Army, by Colonel James Dreyfus, former deputy signal officer of the Fifth Army.

In other Signal Corps key assignments Colonel Harrod G. Miller went from his post as commandant of the Signal School at Fort Monmouth, N. J., an assignment he had held for three years, to become a member of the weapons systems evaluation group in the Office of the Secretary of Defense, Washington. Colonel Miller was replaced at Fort Monmouth by Colonel Reginald P. Lyman who had been signal officer for the Third Army. Colonel E. R. Petzing has been appointed commanding officer of the Signal Corps Engineering Laboratories at Fort Monmouth, the post which had been held by Brig. Gen. Harry Reichelderfer, commanding general of Fort Monmouth. Colonel Petzing had been chief of engineering and technical division, OCSigO, and upon his assignment to the Laboratories was replaced by Colonel C. J. King, formerly assistant chief of the division.

McClelland Work Had Fine Results

The work of General McClelland as director of communications, electronics, Joint Chief of Staff, and chairman of the joint communications-electronics committee is largely hidden by security restrictions, but it is known that his leadership in those posts during the past two years has brought about constructive accomplishments of military communications unification. This progress in unification has stood out most notably in the Korean theater, and in the United States during the expansion of military communications by the three armed services it has produced many beneficial results. It is definitely felt that the work of General McClelland with the Joint Chiefs of Staff has resulted in material economies in the expenditures of the three armed services for communications and electronics operations and procurement during the period of the past two years. General McClelland and his staff have also made material and substantial contributions to the planning and programming in the communications field for the North Atlantic Treaty Organization military forces.

Redman Communications Career

Admiral Redman, with his taking over of the responsibilities of director, communications-electronics, Joint Chief of Staff, will also become the chairman of the joint communications-electronics committee on which he had been serving for the past two years as Navy member.

Most of Admiral Redman's Navy career has been in communications. During World War II from 1942 to 1945 he was assistant chief of staff for communications on the staff of Fleet Admiral Nimitz, commander-in-chief of the Pacific Fleet and Pacific Ocean Areas. He followed this assignment with the command of the *U.S.S. Massachusetts* in the Pacific combat area. After the surrender of Japan he was assigned to command the Naval Receiving Station, and was soon thereafter promoted to rear admiral and designated deputy commander Western Sea Frontier and deputy commander Pacific Reserve Fleet. He assumed the directorship of Naval communications,

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Telecommunications Reports

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Office of the Chief of Naval Operations, in August 1949.

After graduating from the U. S. Naval Academy in 1918, Admiral Redman, who was born in Reno, Nevada, on Jan. 31, 1898, spent the final months of World War I in a U. S. unit of the British Grand Fleet in European waters. In 1925 he commenced his career in naval communications with a tour of duty as radio and communication officer of a destroyer squadron in the Asiatic Fleet. After additional fleet duty as communication officer of a battleship he served two years as assistant district communication officer of the 12th Naval District at San Francisco with additional duty as inspector instructor in connection with the training of Naval Reserve communications personnel. From 1932 to 1934 he served in the Office of Naval Communications in the Navy Department in Washington. This was followed by subsequent tours at sea as radio officer, staff of commander destroyers battle force; as force communication and radio officer, staff of commander scouting force; and finally as fleet communication officer, staff of the commander-in-chief, United States Fleet. After one year in command of a fleet destroyer he returned to duty in Washington in the Office of Naval Operations, serving in the interdepartmental communication liaison division as Navy representative on the interdepartment radio advisory committee to the President.

McClelland Famed As Pioneer

The retiring director of communication-electronics for the Joint Chiefs of Staff, General McClelland, is a noted pioneer of military aviation radio communications and electronic navigating devices. He entered the Army in 1917 as a second lieutenant of infantry after his graduation from Kansas State Agricultural College, and thereafter was associated with Signal Corps and Air Force communications steadily since 1921. During World War II he was responsible for the planning and programming of the development and use of many important radar and electronic devices which were essential to the American military aviation operations. From July 1942 to August 1943 he was director of technical services of the Army Air Forces under which was the supervision of the Air Forces' communications, meteorological, and navigational services. When the directorate of Army Air Forces Communications was reestablished in August 1943, General McClelland, then a brigadier general, headed that branch, first as Chief Air Forces' Communications Officer, and later as director. He continued as director of Air Forces communications until April 1946 when he was transferred to take command of the Airways and Air Communications Service of the Air Transport Command. In 1948 he became deputy commander for services of the Military Air Transport Service, and after a little over a year's service in that assignment he was appointed as the first director, communications-electronics, Joint Chief of Staff.

'General Ankenbrandt, and his successor as director of Air Force communications, General Maude, are also regarded as exceptionally capable and experienced officers in military aviation communications. Both generals, who served in the Signal Corps after their graduation from the same class of 1926 at the U. S. Military Academy until their transfer after World War II to the Air Force, have concentrated their activities in the field of aviation communications-electronics. Both had extensive experience in the operations and requirements of aviation communications in combat theaters during World War II—General Ankenbrandt in the Pacific and General Maude in Europe.

Rear Admiral John R. Redman, USN, the new director, communications-electronics, Joint Chiefs of Staff.

Major General Harold M. McClelland, USAF, former director under JCS, now an assistant director of the CIA.

General Ankenbrandt began his career linked primarily to aviation communications in 1935 as assistant chief of the air navigation unit of the aircraft radio laboratory at Wright Field, Ohio. General Maude started his concentration in aviation communications in 1939 at Hickam Field, Hawaii, where he commanded the 9th Signal Service Company and was in charge of communications at that air base. During World War II, General Ankenbrandt was director of communications for the Army Air Forces in the Pacific Theater and air communications officer of the U. S. Strategic Air Forces. General Maude, in the European Theater, was successively communications officer of the Ninth Bomber Command, director of communications for the 29th Tactical Air Command, and from August 1945 to February 1947 communications officer of the U. S. Air Forces in Europe.

The director of Air Force communications, General Maude, after his return to the United States in February 1947 became chief of staff of the Airways and Air Communications Service in Washington. He transferred from the Signal Corps to the Air Force in April 1947 and in August 1948 entered the National War College. The following June after he had graduated from the War College he became communications officer of the Continental Air Command at Mitchel Air Force Base at New York. He was placed in other fields of activities in September 1949, being appointed assistant director of requirements in the office of the deputy chief of staff for operations at USAF Headquarters. When the directorate of requirements was transferred in January 1950 to the new staff section, the office of the deputy chief of staff for development, he retained the position of assistant director of requirements. In June 1950 he was appointed assistant for development programming on the same staff, directing the development planning of the Air Force. He assumed command in January 1951 of the 1009th Special Weapons Squadron at Bolling AFB in Washington, the post he held at the time of his appointment as director of Air Force communications.

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NEWS

Ankenbrandt Accomplishments

The major accomplishments of the retiring director of Air Force communications, General Ankenbrandt, include the establishment of Air Force communications on a global basis; staff direction of the rapid building up of the aircraft control and warning system and the domestic and overseas radar installations since the Soviet threat; modernization of the air navigational aids facilities of the Air Force through modern radar, GCA, and other systems; planning of the installation of air-ground pilot-operated voice communications instead of air-ground radiotelegraph, as the primary means of communications for the Air Force, based on the highly successful operations of the commercial air lines in the United States.

Also, the inauguration of the high-speed switched wire telegraph printer USAF domestic command communications network, Aircomnet, which was engineered and developed by the Western Union Telegraph Co., the programming and presentation to the Budget Bureau and to Congress of the Air Force electronics requirements during the past five years; and the maintenance of a very close liaison between the Air Force and the Civil Aeronautics Administration on navigational aids and aviation communications.

General Ankenbrandt, who is 47 years old and a native of Chicago, upon his graduation from the U. S. Military Academy was commissioned a second lieutenant in the Signal Corps on June 12, 1926. After spending his first year of Army service at the Sheffield Scientific School at Yale University, where he received a Master of Science degree in 1927, he reported in June of that year to Fort Monmouth, N. J., where he served successively as personnel adjutant of the Civilian Military Training Camp and company commander of the 51st Signal Battalion. In September 1928 he began the company officers' course at the Fort Monmouth Signal School, which he completed a year later. His next assignment was at the U.S. Military Academy where he served as instructor in the department of chemistry and electricity. He remained on the West Point faculty for five years, except for a short period of study at Columbia University.

In August 1934 he went to Hawaii for duty with the 11th Signal Company at Schofield Barracks where he became assistant post signal officer and officer-in-charge of the post meteorological station and the broadcasting system. After two years in Hawaii he returned to the States and was designated assistant chief of the air navigation unit of the aircraft radio laboratory at Wright Field, Ohio—the start of his specialization in military aviation communications-electronics. In July 1940 he went to Langley Field, Va., to the post of signal officer at General Head-Combat Command, with additional duty as commanding officer of the 303rd Signal Company. In March 1942 he was assigned to Army Air Force Headquarters in Washington. He was transferred in July 1942 to the post of theater signal officer for the U. S. Forces in the South Pacific, with station at New Caledonia. In 1944 he went to Hawaii as director of communications for the Army Air Force in the Pacific Ocean Area, and when that headquarters was moved to Guam in January 1945 he retained that position. The following January he was appointed air communications officer of the U. S. Strategic Air Forces at Guam, serving in that capacity for two months.

General Ankenbrandt returned to the States in October 1945 to become air communications officer at Air Force headquarters in Washington. He transferred to the Air Force from the Signal Corps in February 1946 and the following April was appointed air communications officer. In December 1947, after the reorganization of the Air Force, he became chief of the air communications group in the office of the deputy chief of staff for operations, and the following February was named director of communications for the Air Force.

General Maude, who is 49 years old and was born at Framingham, Mass., was commissioned a second lieutenant in the Signal Corps on June 12, 1926, and studied at Yale University for a year to receive his Master of Science degree. After several years of assignments in Western states he entered the Signal School at Fort Monmouth and upon graduation in June 1936 became an instructor there for a year. He then completed a year's course at the Command General Staff School at Fort Leavenworth, Kansas. After service in Hawaii he returned to the States to become commander, in August 1940, of the 2nd Aircraft Warning Company at Mitchel Field, N. Y. The following April he was designated chief of the aircraft warning division in the Office of the Chief Signal Officer, and served in that post until he went overseas to the European Theater in December 1943.

General Maude's successor as commanding general of the 1009th Special Weapons Squadron in Washington is Brig. Gen. Donald J. Keirn, who has been director of research, Air Research and Development Command, Baltimore, Md.

AF Centralizes Movie Service

A centralized Air Force motion picture service has been established by the Air Materiel Command, at Wright-Patterson Air Force Base, Dayton, Ohio, to supervise distribution and use of Air Force films and to provide information on new releases and films cleared for public use. The new service unit will also coordinate and control storage and cataloging facilities. It is expected that the new setup will cut distribution costs, remove conflicting regulations, and eliminate circulation delays. Another feature will be an Air Force Film Library System which will stock prints of all Air Force films. It will also fill emergency requests and supply immediate training needs.

Film Company Seeks TV Channels

20th Century-Fox Bids For Frequencies

Enlargement of the issues of the FCC's scheduled hearing on establishment of a theater television service, to include an issue on whether existing and proposed transmission requirements of the service can be satisfied by the use of frequencies now allocated to the industrial radio services, was asked of the Commission in early September by the 20th Century-Fox Film Corp.

The film producing company said that frequencies allocated to the motion picture radio service appear to be suitable in range for a theater TV service, and could be used on a shared basis, as contemplated in the Commission's rules.

The film company said that frequencies currently available for developmental purposes are more than of sufficient bandwidth to accommodate a nationwide competitive theater TV service; they are the ones most desirable for theater TV, in that equipment in those ranges is currently available; the frequencies are those in which 20th Century-Fox has conducted theater TV experimentation; they could be used on a shared basis, thus permitting further frequency conservation; and the assignment of the frequencies would not prejudice any of the other industrial radio services, since it would be possible for the FCC to distribute the frequencies so mutual interference would not be caused.

Burton Joins NPA Electronics

Robert Burton, formerly chief of the communications division of the Federal Civil Defense Administration and previously State Department international frequency expert, has been named director of the Foreign Section of the National Production Authority's electronics products division. In his new post, Mr. Burton will aid in the handling of applications from foreign countries involving electronics equipment.

Hams Urged To Set Up Network

With a tentative draft of the long-awaited civil defense radio regulations still under scrutiny by the armed services—to spot any possible flaws from a security point of view—amateur radio operators have been urged to move ahead on the setting up of a nation-

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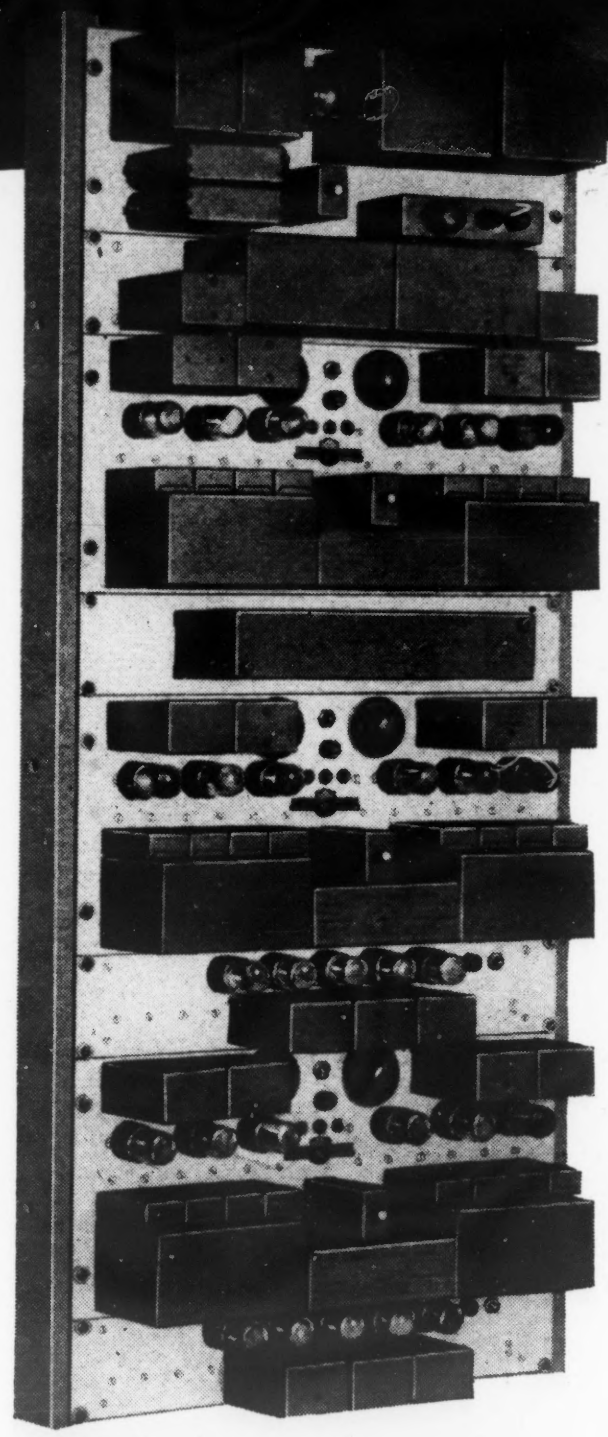


Transmitted Carrier—Inherently Superior

- **No synchronization**
- **No chance for misalignment**
- **No voice frequency shift**
- **No carrier leak adjustments**
- **Signalling by carrier shift**

KELLOGG Transmitted Carrier Systems give approximately equal performance range in all 3 channels on a given wire circuit without adding separate channel amplifiers, *even though the first channel is working near its upper limit.*

*** Stackable channels can be added or removed quickly without altering exisiting equipment.**

Point-by-point and feature-by-feature KELLOGG Carrier Systems offer a combination of advantages not found in any other carrier.

KELLOGG Carrier is a *transmitted* carrier system. Transmitting the carrier frequency instead of suppressing it provides important benefits in carrier performance possible with no other stackable* system.

Equally important, KELLOGG Carrier is built by telephone engineers *exclusively* for telephone use. With KELLOGG there need never be any compromise with highest *telephone* standards.

If you are planning installation of a carrier system or systems, *get all the facts* before you buy. Write to KELLOGG, Dept. 5-I, for its free technical bulletin on Carrier Systems. The steadily increasing demand for KELLOGG Carrier Systems makes early production scheduling advisable.

KELLOGG SWITCHBOARD AND SUPPLY COMPANY
6650 South Cicero Avenue, Chicago 38, Illinois

TELEPHONE EQUIPMENT DESIGNED BY TELEPHONE MEN

wide network of radio stations on the frequencies which have been designated for their use.

Full organization of new and existing amateur radio stations capable of operating on the special amateur band segments assigned for wartime civil defense communications had been urged at the July 27-29 annual session of the American Radio Relay League in Seattle, Wash. The civil defense radio rules, when released in their final form, are expected to provide for all radio functions relative to civil defense activities, it was pointed out, but since it will still be some time before they are released, the amateur radiomen have been advised to set up their facilities under the existing regulations.

The plans had been discussed at the ARRL convention by Federal Civil Defense Administration, FCC, ARRL, and armed services officials during a civil defense forum. The annual session was attended by 750 amateur operators and 650 other guests.

Civil Defense May Get Radio Funds

When the Senate Appropriations Committee takes up the 1952 fiscal year appropriations requirements of the Federal Civil Defense Administration, the warning and communications division, which fared better than the other FCDA activities, will try to have restored the $1.5 million "contributions" fund lopped off by the House for two-way radio communications linking the nation's civil defense control centers. The House had cut the fund proposal for this purpose by approximately half.

As soon as Congress enacts the appropriations measure the warning and communications division will start the awarding of equipment contracts to the manufacturers of point-to-point, mobile and portable radio transmitters and receivers and associated apparatus.

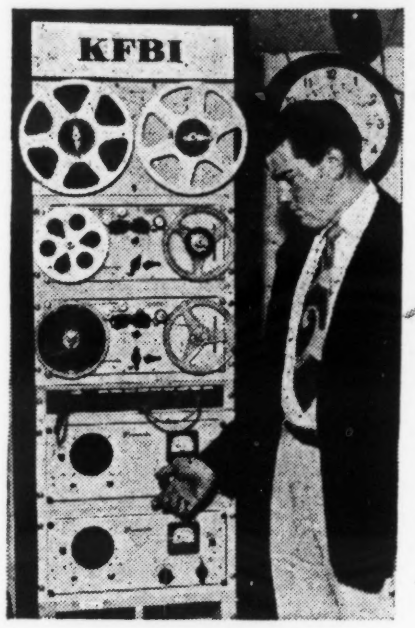
The programming and contracting plans have already been formulated and the total amount for radio equipment, if the House-approved appropriations stand in the final enactment, will be approximately $5.5 to $6 million. Of this around $3.6 million is for the nationwide "command" radio communications system between the federal headquarters and the states and regions, contained in the $4,170,000 for operations and $240,000 for the attack warning system which were approved by the House, the same amounts as asked for by President Truman.

The $1.5 million fund, approved by the House, which has to be matched by an equal amount by the states and municipalities, is for the establishment of two-way radio communications between the control centers of the country. There are projected 200 control centers, with the radio equipment for each center to cost $15,000.

(*Continued on page* 57)

* MAGNECORDER *Sound Performance*

FOR BATTLE-FRONT . . . FOR BROADCAST! *



Minutes after being liberated from a Chinese Communist prison camp, this U. S soldier reports to Army Intelligence and to the world. Portable Magnecord tape recorders are on the spot to record his courageous words. Serving all over the world, Magnecorders undergo "battle-front" conditions and still continue to record with high fidelity and dependability the moment they are needed.

Using Magnecorders, KFBI, Wichita, Kansas, handles delayed programs and "on location" recordings with complete confidence. In the field or at the station, dependable Magnecorders are the first choice of radio engineers everywhere.

MORE FEATURES
PT7 accommodates 10½" reels and offers 3 heads, positive timing and pushbutton control. PT7 shown in console is available for portable or rack mount.

GREATER FLEXIBILITY
In rack or console, or in its really portable cases, the Magnecorder will suit every purpose. PT6 is available with 3 speeds (3¾", 7½", 15") if preferred.

HIGHER FIDELITY
Lifelike tone quality, low distortion, meet N.A.B. standards — and at a moderate price. PT63 shown in rack mount offers 3 heads to erase, record and play back to monitor from the tape while recording.

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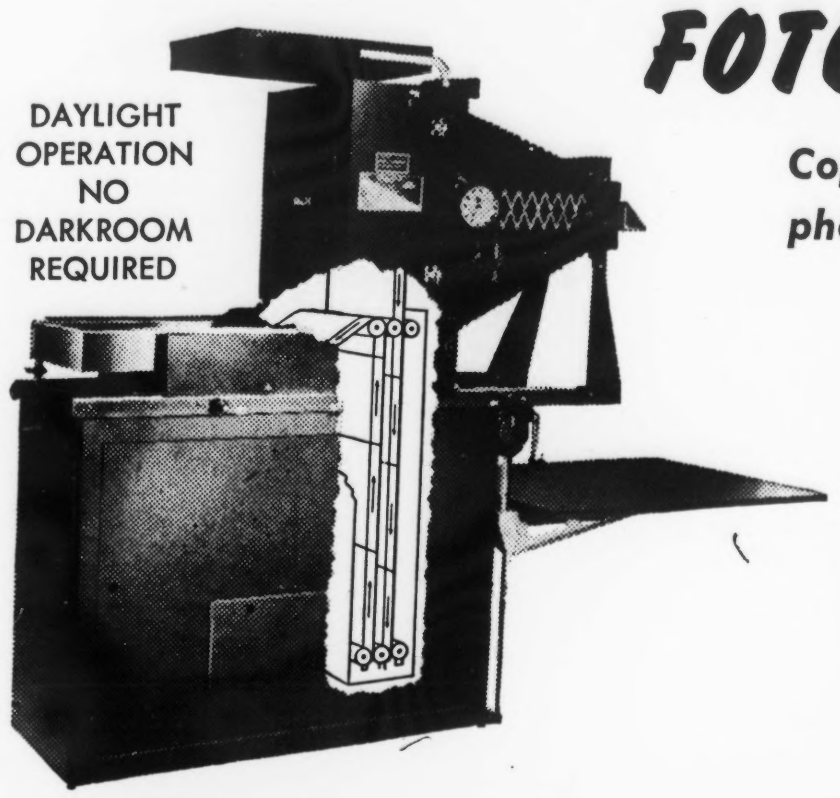

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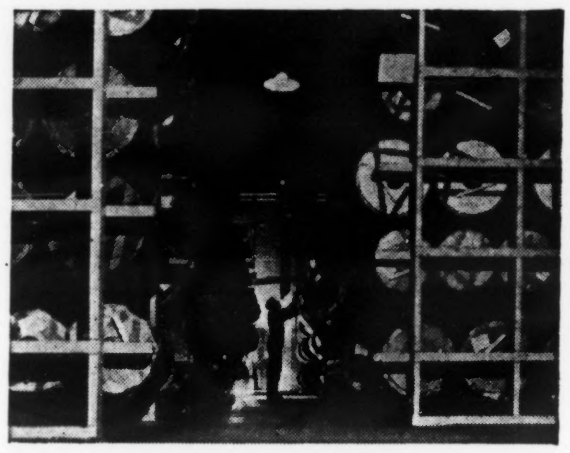

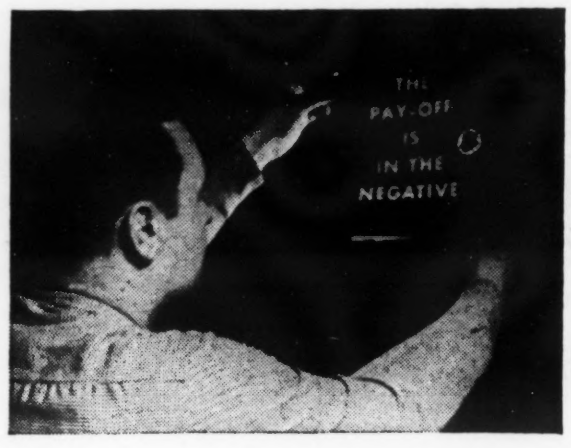

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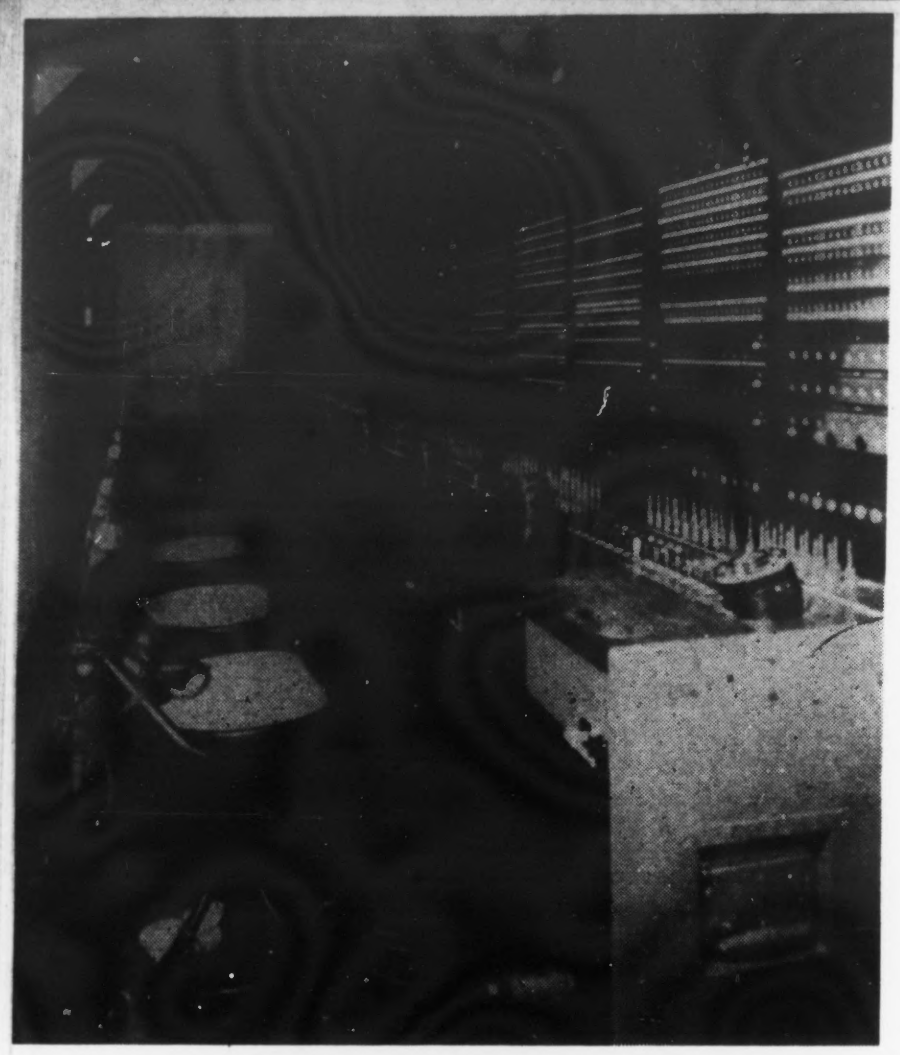
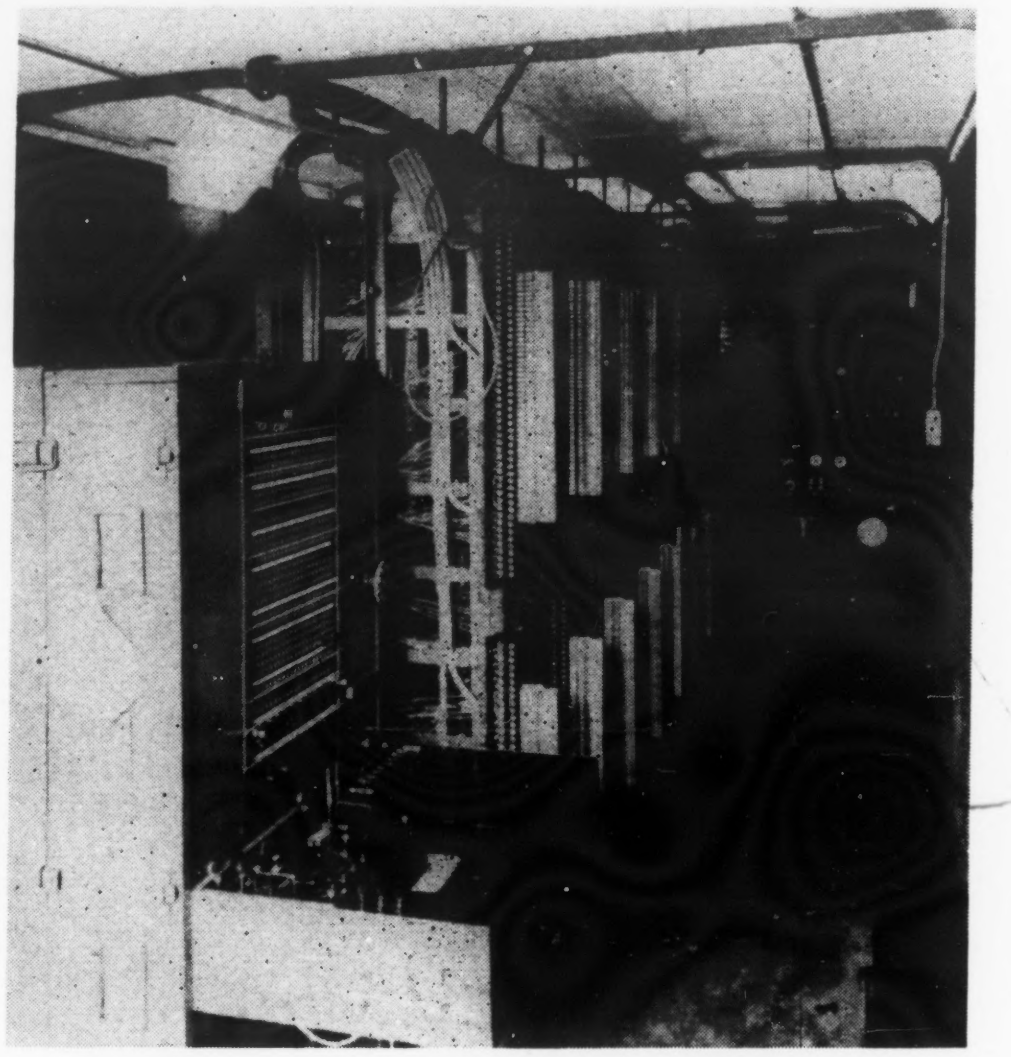


Close up of twelve position switchboard after installation in semi-trailer



Test desk, main frame and power equipment installed in semi-trailer.

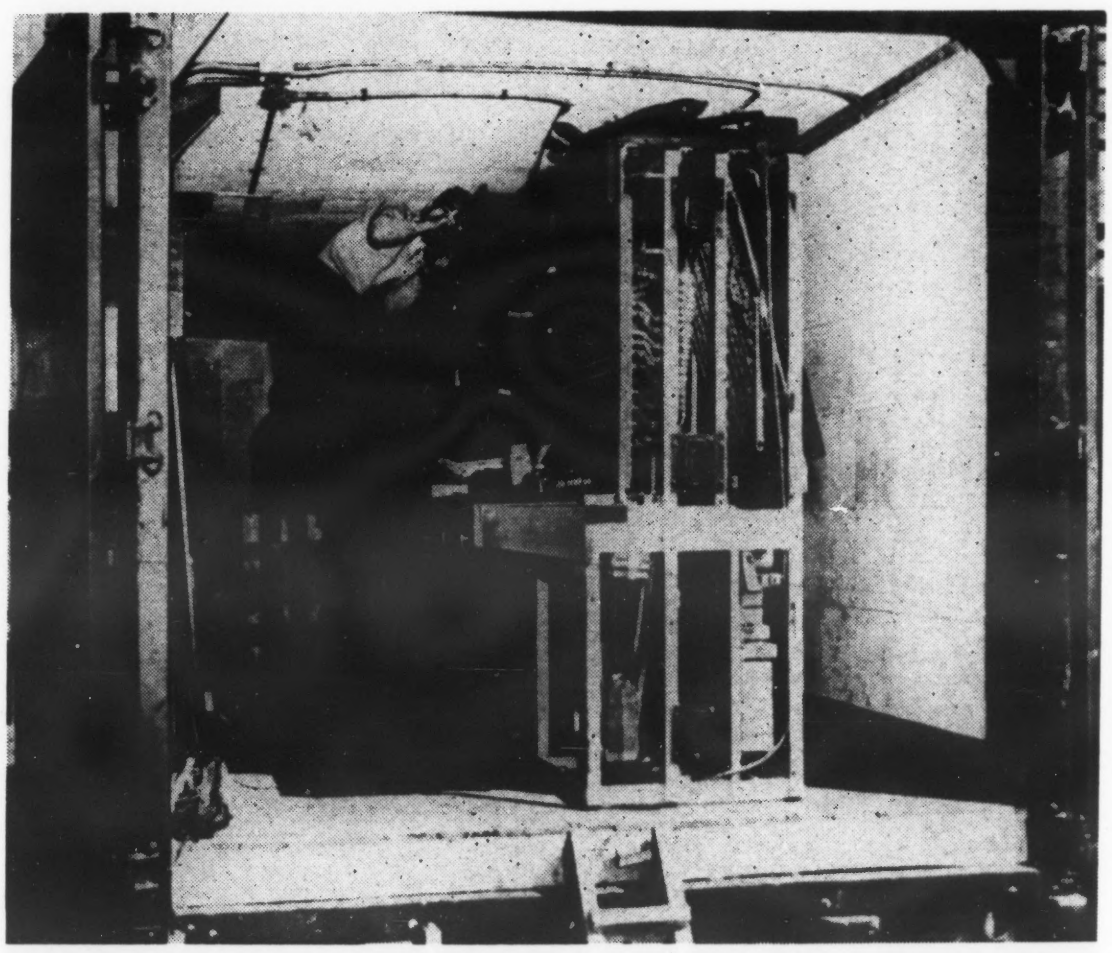
Every time the Eighth Army moves in Korea it must transplant enough telephones and switchboard equipment to serve an American community of 5,000 persons. Yet the Signal Corps handles this task as smoothly as "Painless Parker" pulls an aching tooth.

Americans prefer to do business on a telephone, whether that business is in Kokomo, Indiana, or Korea. Right now business in Korea is heavy. Busy Signal Corps telephone operators at Eighth Army Headquarters handle an average of 31,000 local and 5,000 toll calls per day. At the peak hour of each day between 11 a.m. and noon they must rush through 1,800 local and 400 toll calls.

To handle this rush of calls and provide faster service, Signal Corps personnel in the Far East Command recently designed and had delivered to Korea a twelve operator switchboard mounted inside a semi-trailer. It will replace the six operator mobile board now in use with 360 common battery lines, 180 magneto lines, and 105 trunks to other switchboards.

The larger board is a product of Signal Corps design, American ability to improvise from materials on hand, and quick assembly by a Japanese manufacturer. When the need for a larger board arose Signal Corps on-the-spot telephone engineers had no suitable equipment available. Since time was of the essence they called in representatives from Japanese electrical manufacturers, explained the problem and asked for contract bids.

The job was to take two six-position switchboards, rewire them so they would operate as one, install them in an 11 ton semi-trailer, and mount the auxiliary equipment for the switchboard in a second trailer. All the equipment, including the vans, would be furnished by the Army, but the fabrication job had to be finished in 30 days or less. Twenty-three days later the Oki Electric Company of Japan delivered the vans completely fabricated with insulation, soundproofing and both heating and lighting systems.



Interior view of semi-trailer showing initial stages of switchboard installation.

(*Continued from page* 54)

Wire and radio communications are regarded by the FCDA as co-equal in the civil defense communications requirements. Mobile radio communications — safety — private vehicular, and industrial services—are highly important, and the FCDA officials feel their growth since the end of World War II has been extremely advantageous in the planning for communications facilities in event of any atomic bombing disasters.

It is regarded without question that Colonel William Talbot, FCDA warning and communications division director, and R. H. McRoberts, his principal aide in radio communications, have been working in the closest liaison with the telephone and radio communications companies.

It was announced September 7 by FCDA Administrator Millard Caldwell that more than 11,000 civil defense workers in New York, Baltimore, Philadelphia and Washington, the latter city originating the program, will receive training through theater television beginning Sept. 15. If this TV technique is successful, a series of training programs may soon be inaugurated throughout the nation.

IT&T Acquires Kellogg Stock

The diversification of the domestic U.S. activities and investments of the International Telephone & Telegraph Corp., which has moved ahead steadily in recent years under the direction of Col. Sosthenes Behn, I.T.&T. board chairman, took another long stride with the recent announcement that I.T.&T. had purchased a substantial interest in one of the pioneer and most successful independetn telephone manufacturing companies, the Kellogg Switchboard & Supply Co. of Chicago.

President James H. Kellogg of Kellogg Switchboard & Supply, in welcoming I.T.&T. as a stockholder, said no change is contemplated in the operation or management of the company.

I.T.&T. purchased 82,422 shares of Kellogg common stock, or 31% of the total outstanding, at $23 a share, and 3,148 shares of preferred stock, or 40% of the total, at $110. The price was more than $2,240,000.

The stock purchased was that of James G. Kellogg, father of the present president of the Kellogg company, held by Mr. Kellogg individually and as trustee, and also that of some of his associates. Earlier last week, the retirement of Mr. Kellogg as board chairman and a director of the company, after 42 years with the company, was announced. None of the stock owned by President James H. Kellogg of the company, or Mrs. Kellogg, was involved in the sale.

The Kellogg company, which occupies more than 300,000 sq. ft. of manufacturing space in Chicago, was found-

(*Continued on page* 62)

MN-85 — Fly OMNI-RANGE with the world-famous Bendix NA-3 Navigation System of which the MN-85D receiver is the heart. Precision built to military standards, the MN-85D is a truly fine — ultra sensitive — extremely stable crystal controlled superheterodyne receiver. Used in conjunction with the Bendix OMNI-MAG indicator you can enjoy "picture window" flying in any weather.

TA-18 — For clear, reliable communication every time, the new Bendix TA-18 airborne V. H. F. transmitter is the answer. Just select any of 180 V. H. F. channels with a dial calibrated directly in megacycles. No special skill is required to set the TA-18 on the nose, no dial twisting, no rocking back and forth — just set it on the desired channel and you will be "loud and clear" regularly. A full 25 watts of R. F. Power is available, crystal controlled on every channel.

Write now for detailed technical information on the Bendix TA-18 transmitter and NA-3 navigation system, a perfect pair for the latest and the best in V. H. F. communications and navigation.

Whatever the Plane or Purpose . . .

Bendix Radio is the Choice

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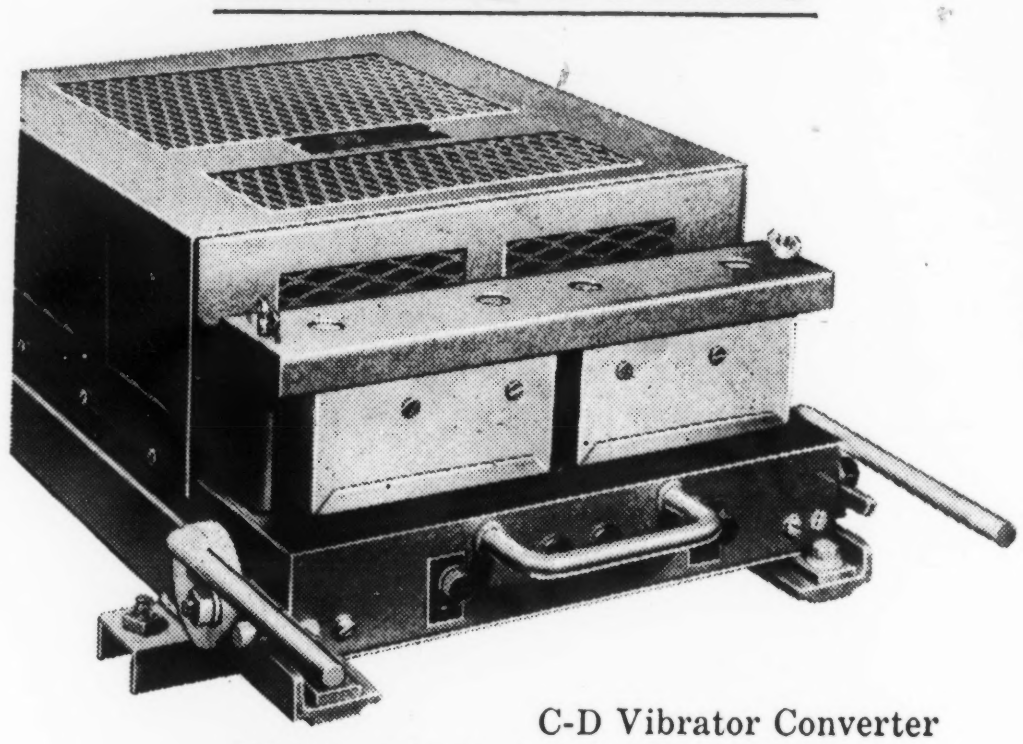
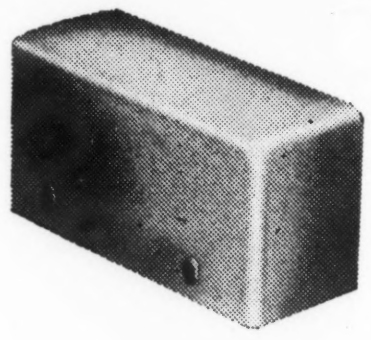
Canadian Distributor: Radio Engineering Products, Ltd., 4305 Iberville Street, Montreal, Quebec

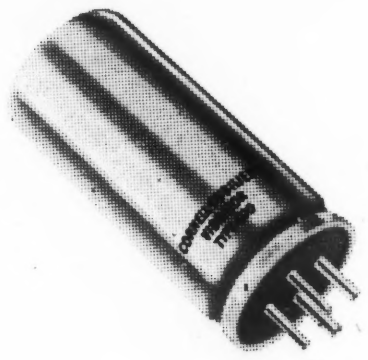
IT'S C-D FOR VIBRATORS & CONVERTERS



C-D Vibrator Converter with the exclusive double vibrator automatic self-service feature. Developed by C-D engineers for the major railroads; can be applied wherever continuous duty is a "must."



Hermetically-sealed, heavy-duty C-D Vibrator—for AC heaters, wing deicers, engine pre-heaters, etc.



24-volt, 115 cycle synchronous C-D Vibrator, built to military specifications.

If you don't have C-D's latest Vibrator & Converter Catalog, write today for your personal copy. Cornell-Dubilier Electric Corp., Dept F91, Indianapolis 8, Indiana.

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VIBRATORS • CONVERTERS

Plants in South Plainfield, N. J.; New Bedford, Worcester, and Cambridge, Mass.; Providence, R. I.; Indianapolis, Ind.; Fuquay Springs, N. C.; and subsidiary, The Radiart Corp., Cleveland, Ohio

Above: Lt. Delo at switchboard of his own design.

The Army will have its new telephone switchboard in two wars if the hopes of 1st Lt. Avery W. Delo are realized.

A PBX installer with Michigan Bell before being recalled to active duty, Lieutenant Delo, executive officer of "A" Company of the 321st Signal Battalion assigned to VII Corps, has designed a switchboard that is simpler, lighter, cheaper and—from results of one month's operation—is more efficient that the standard BD-72.

When the 321st arrived at the Fort Bragg Military Reservation for the joint Army-Air Force training maneuver, Exercise Southern Pine, Lieutenant Delo found his company was without a switchboard.

"We needed one for maneuvers," he said, "so I had to make one. I didn't set out to design an entirely new board, but I did feel the BD-72 could be improved."

He started drawing plans on August 1 and eight days later he had installed a working model in the company orderly room.

The new board is approximately half as heavy as the 72-pound BD-72. This weight drop resulted from elimination of the old talk-and-ring keys a constant source of trouble according to Lieutenant Delo. "In their place," the Signalman said "I installed one signalling cord circuit. Positively nothing can go wrong with it."

Another innovation is a monitor jack for every circuit. Lieutenant Delo claims that any operator can monitor any circuit already completed without disrupting service.

"Also," added the inventor, "I added a line lamp, usually found only on common battery boards. In darkness or semi-darkness it gives the operator a visual as well as audible signal. As a matter of fact you might call the new board a local-battery switchboard with a common-battery feature."

Simplicity is the keynote of Lieutenant Delo's model. Maintenance is made easier in that all the important parts are mounted near the top of the board. "I think anybody with a basic knowledge of signal work could repair it easily," he said. "My switchboard men learned to operate it in three or four minutes."

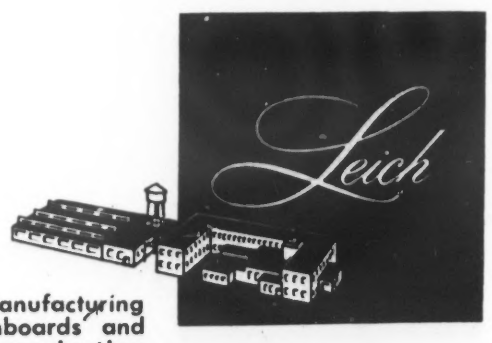
The board, as built, can handle a combination of 10 trunks and locals, but it could be modified to handle as many lines as the Army sees fit. And—with all these improvements—the board is approximately $120 cheaper to build that the BD-72.

Most members of the 321st who have seen the board have been favorably impressed, including the Battalion Commander, Lt. Col. Lawrence G. LeFavour, who said. "I am going to recommend to the Signal Corps that this switchboard be considered for adoption."

simplicity wins . . .

THE SAME LEICH TELEPHONE THAT IS A DESK MODEL . . . IS ALSO A WALL MODEL . . . NO CHANGES OR ADDITIONS NECESSARY . . .

- Here's a simple idea that saves time, work, money and confusion for those responsible for the operation of a telephone system.
- The hookswitch levers on the Leich telephone protrude from the corner of the cradle at a 45 degree angle. In this way they operate equally well whether the telephone is set on a desk, or turned up and over and mounted on the wall.
- In other words, this one Leich telephone can be used as a wall or as a desk model, will fit every installation requirement. No changes or additions are necessary.
- With this sensible arrangement it is necessary to stock only one type of instrument. Every installation can be made with the individual user having his choice of wall or desk installation. Even when the user changes his mind, the same instrument can be used.
- This is the kind of telephone you can depend on for efficient, trouble free operation. Transmission and reception are crisp and clear, over the widest possible voice range. The Leich ringer will perform faithfully for years without requiring adjustment. The anti-side tone high frequency induction coil and hermetically sealed condenser assure excellent service.
- Tens of thousands of these Leich telephones are in service all over these United States. Users are reporting enthusiastically about their performance. Write today for our catalog which gives complete information on Leich 600 series telephones.



Leich has been manufacturing telephones, switchboards and associated communication equipment since 1907. The combination wall and desk telephone, and many other improvements in modern telephony are Leich developments.

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METAL	GOVERNMENT SPECIFICATION	ACP SPECIFICATION CHEMICAL
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ZINC	QQ-P-416 RR-C-82 JAN-F-495 AN-F-20 U.S.N. Appendix 6	*"LITHOFORM"*

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"GRANODINE" forms a zinc phosphate coating on steel and zinc surfaces. This non-metallic bond holds and protects the paint finish and thus preserves the metal underneath.

"PERMADINE"®

"PERMADINE" forms an oil-adsorptive zinc phosphate coating on steel, which, when treated with rust inhibiting oil, is highly corrosion resistant.

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"THERMOIL-GRANODINE" forms a manganese-iron phosphate coating on steel, which, when oiled, provides wear-resistance for rubbing parts — and, when oiled or painted, inhibits corrosion.

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"ALODINE", the new ACP protective coating chemical for aluminum, anchors the paint finish and protects the metal painted or unpainted.

"LITHOFORM"®

"LITHOFORM" makes paint stick to galvanized iron and other zinc and cadmium surfaces.

Write for more information on these products. Send for new descriptive folders on the ACP metal-protective, rust proofing and paint bonding chemicals listed in this advertisement.

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Edwin Y. Webb, Jr., chief of research and development, Signal Corps Intelligence Agency, receives Certificate of Appreciation award from Maj. Gen. Thomas W. Herren, commandant, MDW.

Edwin Yates Webb, Jr., chief of research and development, Signal Corps Intelligence Agency, one of the many scientists recruited from government and industry to assist the Joint Chiefs of Staff during World War II, recently received a Certificate of Appreciation award for his part in assisting the armed forces and the U.S. industrial machine toward victory in the war. Maj. Gen. Thomas W. Herren, commandant of the Military District in Washington, representing Army Secretary Frank Pace, Jr., made the award August 31 in an appropriate ceremony at MDW headquarters.

The primary mission of the wartime technical industrial intelligence committee, to which Mr. Webb and other scientists were assigned, was to send experts in research and development in all scientific fields to Germany after the Nazi capitulation, in order to gather information regarding inventions which the U.S. could capitalize on in the war still being waged against Japan. Examples of these inventions include the sniperscope, a device used to see in total darkness by the use of infra-red light; the tape recorder, which is regarded as a German invention; and the metallized paper condenser which has cut the cost of making the product in this country. In the condenser invention the Germany have applied a metallic coating on paper instead of the previous practice of using a separate foil between the papers.

Mr. Webb, formerly with the Bell System in Atlanta for 17 years, is the author of "Origin of the Universe and The Secret of Light and Magnetism," a chapter of which is published in this issue of SIGNAL (*see page 19*). The book is also reviewed in this issue's book section (*see page 78*).

Joint Communications-Electronics Committee

The Joint Communications-Electronics Committee, the present members of which are shown on the cover of this issue of SIGNAL, is the successor to the Joint Communications Board which was created early in World War II as a supporting agency of the Joint Chiefs of Staff. The committee is made up of a permanent chairman, who is also the director of communications-electronics for the JCS; the Chief Signal Officer of the Army; the Director of Naval Communications; and the Director of Air Force Communications.

The office of director of communications-electronics for the JCS, presently held by Rear Admiral John R. Redman, USN, *(see story, page 48)*, was established by the Secretary of Defense to insure maximum economy and efficiency of military communications, and to strengthen the JCEC activities.

Most of the work of the JCEC is done by permanent panels and special working groups, operating through "coordinators" who effect liaison between the JCEC and the working panels. Each of the services has an equal number of members and alternates on the JCEC and all its panels.

To Design Engineers with Special Capacitor Problems . . .

HERE ARE TWO DIFFERENT CENTRALAB CERAMIC CAPACITORS WITH UNUSUAL HIGH VOLTAGE, HIGH ACCURACY CHARACTERISTICS

FOR HIGH VOLTAGE . . .

Centralab's Type 850 series high voltage (7500 to 20,000 Volts D. C.) ceramic capacitors are designed for transmitters, induction heaters, electronic welding equipment, x-ray, diathermy or other similar high voltage, high frequency circuits. They have extremely low power factor and stable retrace characteristics. Small physical dimensions make them well suited to high-powered portable or mobile transmitters and similar equipment where space and weight are at a premium. Long leakage paths and rugged mechanical construction are afforded by Centralab's unique "double cup" design. Centralab's High Voltage ceramic capacitors meet specifications of JAN C-20A for humidity test.

FOR HIGH ACCURACY . . .

Centralab's type 950 high accuracy ceramic capacitors (500 to 2,400 mmf) represent the ultimate in precision for exacting electronic applications. Extremely rigid capacitance and temperature coefficient tolerances make them well suited to oscillator circuits of primary and secondary frequency standards, frequency meters and similar precision electronic equipment. Low inductance and low power factor permit operation at virtually all radio frequencies. Each capacitor is hermetically sealed in a silver plated brass, cup-shaped shell which shields it against stray capacitance effects. Shell is connected at ground potential through the threaded stud which holds it to the chassis.

When it comes to high voltage or high accuracy capacitors — you can't beat ceramics — Centralab ceramics — the most permanent type capacitors. Both Type 850 series (high-voltage) and Type 950 (high accuracy) have proven life tests of 1000 hours at + 85°C at voltages well in excess of rating in accord with proposed RTMA Standards. The ceramic dielectric used is Centralab's exclusive Ceramic X. Terminals are silver plated brass or copper. Power factors are .1% maximum measured at 1 megacycle. For complete information on Type 850 Series (high voltage) and Type 950 (high accuracy) capacitors — write for bulletins listed. Special capacitors and engineering assistance available.

You can get complete technical data and specifications on Centralab's Type 850 Series (High Voltage) and Type 950 (High Accuracy) capacitors. Write for Bulletin 42-102 or Bulletin 41-123 respectively.

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Division of GLOBE-UNION Inc.

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(*Continued from page 57*)

ed in 1897, and has long been one of the most successful firms in the Independent telephone manufacturing field. It produces a full line of dial and manual telephone instruments, known as Masterphones; Relay-matic automatic switching equipment; Masterbuilt manual switchboards; carrier systems; and repeaters, in its full line of telephone equipment. In addition, the company has been acting as distributor for the National Carbon Co., Gould Storage Battery Corp., and John A. Roebling's Sons Co., the latter a cable and wire producer, and several other telephone parts manufacturers.

Purchase of the substantial percentage of Kellogg stock rounds out I.T.& T.'s interests in all phases of communications manufacturing in the United States. Its subsidiaries, including Federal Telephone & Radio Corp., Capehart-Farnsworth Corp., and Federal Telecommunication Laboratories, are among the leaders in extensive operations in communications-electronics manufacturing and research, including mobile communications, television, broadcasting, aviation, telephone, and point-to-point communications equipment.

The retiring Kellogg Board Chairman, James G. Kellogg, joined his father, Milo G. Kellogg, in the administration of the company's affairs in 1909. Since 1910, he has been a board member, serving continuously until his retirement. He has been a company executive for more than 40 years, and was one of the leaders and pioneers in the Independent telephone manufacturing field.

Guam Communications Improvement

The Navy Department announced recently that it had released $7,302,765, the last increment of funds needed to complete the $38 million island-wide utility system for Guam. These funds will cover the cost of building the final links in the telephone system.

The completion of the telephone system will be the construction of the second of two exchanges. The Navy is working toward giving the armed forces establishments on Guam more than 4,000 automatic telephone lines. One exchange is now being completed and the building to be constructed under the new funds will provide an additional 1,400 automatic telephone lines.

To perfect its contemplated radiotelephone and radiotelegraph service to and from Guam, slated to be inaugurated for public service about Oct. 15, RCA Communications, Inc. applied to the FCC in mid-August for two additional frequencies for radiotelegraph service. Two of the frequencies, 10620 and 15475 kc, will be utilized both for radiotelephone and radiotelegraph, while the third, 9827.5 kc, will be for radiotelegraph.

Navy Commissions for Photography Specialists

The Navy Recruiting Service is now accepting applications for commissions as Photography Specialists, USNR. Selected candidates will be appointed ensign or lieutenant (junior grade), depending upon age and qualifications.

Candidates must have reached their 19th but not their 33rd birthday at the time of submission of application. They must be graduates of accredited colleges or universities, with baccalaureate degrees (4 year course), with at least 30 semester hours in mathematics, physics or chemistry. Two years of civilian or military experience in general photography will be considered as basis for waiver of the 30 semester hour requirement.

Candidates with experience and/or educational background in any of the following fields are desired for this program:

(a) For general photography duties:
Commercial photography (laboratory, still, motion picture, aerial mapping, newsreel or supply.)

(b) For photographic interpretation duties:

Cartography	**Forestry**
Photogrammetry	**Civil Engineering**
Geography	**Architecture**
Geology	

Five years of professional or military experience in photography is required of applicants appointed as lieutenant (junior grade).

It is not expected that continuous active duty will be available for new appointees under this program. However, upon delivery of commission, appointees may request active duty if they so desire.

Further details may be obtained at the nearest Navy Recruiting Station.

NAVY PERSONNEL CHANGES

Wenger Nominated Rear Admiral

Capt. Joseph N. Wenger (SDO USN), first special duty officer specializing in communications to be selected for promotion to flag rank, nominated for promotion to the temporary rank of rear admiral. Capt. Wenger was recently named to be Navy representative on the Armed Forces Security Agency.

Kurtz to San Diego Station

Capt. Thomas R. Kurtz, Jr., USN, who has headed the procedures and public section of the Naval Communications Division, has become commanding officer of the naval communication station at San Diego, and district communication officer on the staff of the commandant.

Conaughty Succeeds Torgerson

Another change in key personnel was the selection of Comdr. Robert B. Conaughy, USN, as Navy Department communication officer. He succeeds Capt. Theodore A. Torgerson, who has reported for duty overseas.

New Navy Radar Picket Vessels

New Radio Stations At Kodiak

Conversion of 12 destroyers to radar picket destroyers and four submarines to radar picket submarines have been included in the project orders of the Navy's Bureau of Ships issued to ten Naval shipyards for conversion and modernization of 98 vessels. The Navy Department also disclosed that contracts will be let this fall for the construction of a radio transmitter station and a radio receiver station and other communication facilities at Kodiak, Alaska. The conversion to the radar picket submarines will be done at the Philadelphia Naval Shipyard, and conversion of the destroyers to radar picket destroyers will take place at the Boston, Mass., Portsmouth, Va., and Long Beach, Cal., Naval shipyards.

WW II Chief Cable Censor Dies

Full military honors were accorded Captain Herbert Keeney Fenn, (USN, ret.), who served with great distinction during World War II as chief censor of international cable, radiotelephone and radiotelegraph communications, in his funeral and burial in the Arlington National Cemetery, Aug. 15. Capt. Fenn died at the age of 60 at his home at Hendersonville, N. C.

Captain Fenn, who served in both world wars during his 35 years in the Navy, was communications officer with the Pacific Fleet when he was assigned to organize the censorship of all communications entering or leaving the United States and its Territories prior to the entrance of this nation into World War II. After the war he was placed in command of the U.S.S. Prairie and after three years of sea duty he retired in 1948.

Aeronautical Radio Rules Amended

The FCC in mid-August amended its aeronautical radio rules to provide certain frequencies within the 118.1-126.7 megacycle band for use by aircraft and airdrome control stations. The amendments, which were to become effective Oct. 1, enable all aircraft, regardless of type, which operate in instrument weather, to use the same facilities and to facilitate the control of traffic by airdrome control stations, the Commission said.

Meanwhile, the Civil Aeronautics Administration has asked the FCC to hold "full and open" discussion on the Com-

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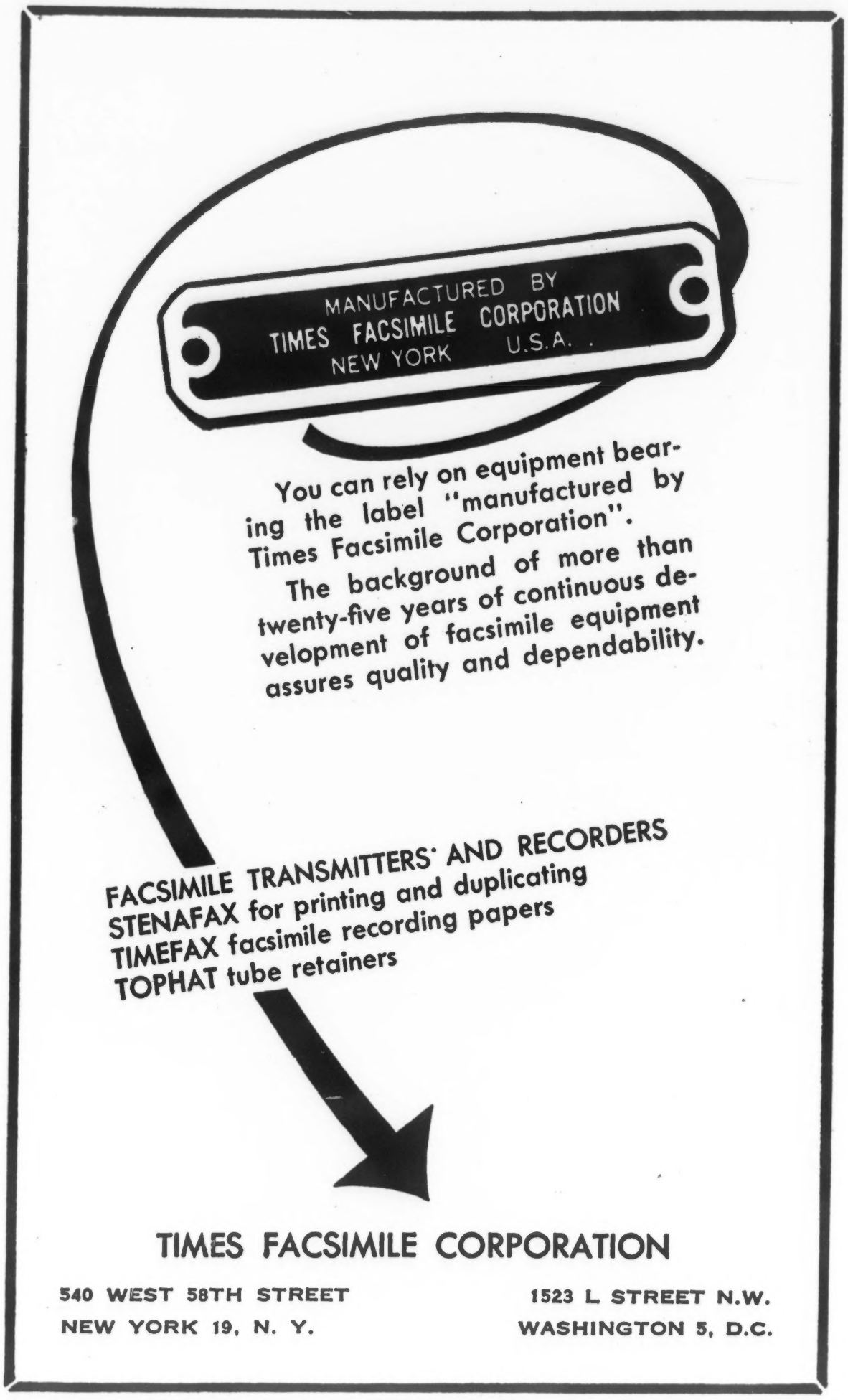

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mission's rulemaking proposal to allow the use of the frequency 122.8 mc by private aircraft for civil defense purposes. CAA Administrator Charles F. Horne said that the CAA, the Federal Civil Defense Administration, the National Association of State Aviation Officials and the Aircraft Owners and Pilots Association should take part in the discussions.

Horne Urges Pilots To Use Radio

Civil Aeronautics Administrator Charles F. Horne recently renewed his plea to the nation's aircraft pilots to make use of their radio-communication facilities in every instance possible to avert or alleviate serious difficulties arising from the failure to communicate with established CAA facilities over which they may be flying.

Capt. Horne cited an instance in Alaska where one flier, forced 45 miles off-course by weather and out of gas 60 miles from his destination, landed in an isolated, inaccessible spot with no one knowing his position simply because he did not make use of this two-way radio facility, despite the fact that he passed almost directly over a CAA navigation station en route to his forced landing.

A week of expensive and futile searching for the lost plane was called off only after the pilot and his passengers made their way to civilization.

Hobbs Advisor to MB Chairman

Marvin Hobbs, head of the office of electronics programs of the Munitions Board, has been named advisor on all phases of Department of Defense planning for electronics radio and radio requirements. He will be the consultant to Munitions Board Chairman John D. Small and Munitions Board Vice Chairman for production and requirements C. W. Middleton.

Mr. Hobbs has served as chief of the electronics programs office since August, 1950, prior to which, from May to August of that year, he was deputy chief and, part of the time, acting chief. In his new post, Mr. Hobbs will also coordinate the work of the electronics production resources agency and the electronics production board with the Munitions Board programming work.

Col. Clifford A. Poutrie, former commander of the Yokahama Signal Depot, with the Eighth Army, and, since, an instructor at the Signal School at Ft. Monmouth, N. J., has been named to succeed Mr. Hobbs as chief of the electronics programs office. Electronics programs' main tasks are approving production schedules and phased requirements for controlled materials for the electronics and radio industry and production schedules for the armed services.

Williams of Automatic Electric Replaces Hill at NPA

Robert E. Williams, an official of the Automatic Electric Co. of Chicago, who has had a long and varied experience in both the operating and manufacturing phases of the communications industry, was slated to join the National Production Authority's communications equipment division as a consultant on Sept. 1 and subsequently to succeed Luther W. Hill, president of the Carolina Telephone & Telegraph Co., as director of the division.

Mr. Hill was to complete his six-month tour as division director on Sept. 30, and return on that date to his post as president of the Carolina company. During his service with CED, Mr. Hill has directed its organization to a point where it is recognized as one of the most efficient of NPA divisions staffed by a competent group made up of both industry representatives and government career personnel.

Among his many accomplishments, the Carolina Tel. & Tel. chief executive is credited with devising the rotation system which will bring Mr. Williams into division operations a month before the departure of the man whom he will succeed. At the start of October, it is understood, another consultant will be brought in to serve with the present deputy director, Warren Chase, who will return to the Ohio Bell Telephone Co. in November after rounding out his six months with NPA.

In this way there will be an overlapping of top-staff officials which will assure continued, uninterrupted efficiency in the operation of the division. Mr. Hill suggested such a succession system to NPA authorities who accepted it so enthusiastically that it will probably become the pattern for the replacement of all industry officials and experts who are being "loaned" to the government.

Mr. Williams, in his most recent assignment with Automatic Electric, the principal manufacturing unit of the Theodore Gary and Co. group of communications companies, has been acting in an advisory capacity to Automatic Electric's customers in the Independent telephone operating field on matters relating to financing rates, accounting and other phases where his broad telephone experience could be of value.

Identified in various executive and administrative assignments with the investment, operating and manufacturing companies in the Gary group since 1927, Mr. Williams joined the organization that year in Kansas City, Mo., as assistant secretary of Telephone Bond & Share Co. From 1927 until 1939 he held fiscal and corporate positions in the principal investment companies in the Group, Associated Telephone & Telegraph Co. and Telephone Bond & Share Co., as well as the parent company, Theodore Gary & Co.

In 1939 he was transferred to the operating service center for the domestic telephone operating subsidiaries as vice president of Telephone Services, Inc., at Ft. Wayne, Ind.; and in the 1939-45 period he served in managerial and administrative capacities with Gary operating companies, approximately 25 in number and serving several hundred thousand telephones in 18 states. In 1945 Mr. Williams moved from Ft. Wayne to Chicago where he assumed broadened duties in connection with the operating of all companies in the group, including the telephone companies abroad and the investment companies. In 1947 he was appointed chief executive of the Gary Group Telephone Operating Division and assumed supervision of both domestic operating companies and those operating abroad.

Mr. Hill joined NPA as director of the communication equipment division on April 2, bringing to the post not only 35 years of all-around experience in the telephone plant and traffic administration, but also extensive knowledge of mobilization requirements which he gained during 3½ years, in 1939-43, as the general coordinator of national defense activities of the Southern Bell Telephone & Telegraph Co. in eight Southern states.

Radio-TV Plants Idle Says McDaniel

Although military procurement of electronics and communication equipment is currently at the annual rate of $3.8 billion, the radio-television industry is suffering from unemployment and plant shutdowns because defense orders have not taken up the slack resulting from the recent decline in video set sales, President Glen McDaniel of the Radio-Television Manufacturers Association reported Aug. 23 in a talk at the Pacific Electronic Exhibit by the West Coast Electronic Manufacturers' Association.

Mr. McDaniel said that contracts actually let by the military services during the first fiscal year after the Korean war totaled $3.8 billion, and defense officials estimate that another $3.8 billion in electronics-communications contracts will be awarded in the current fiscal year.

"Information submitted recently by RTMA member-companies," Mr. McDaniel reported," indicated that, on an average, set and parts manufacturers in June, 1951, were utilizing only half of their plant capacities in both defense and nondefense production. This was broken down roughly as 11% (of total capacity) for defense work and 39% in nondefense manufacturing. An earlier RTMA survey showed losses of employment of 50,000 among association members alone in an industry that normally employs about 200,000."

Noting that the whole character of manufacturing requirements has

A page from the note-book of Sylvania Research

Sylvania Develops Accurate Contrast Measurement of Television Image

The "large area contrast ratio" of a television image is of utmost importance in producing high quality pictures. It is a figure of merit which is indicative of the sharpness with which objects in the picture stand out against the background. A method of accurately measuring this contrast ratio was developed by the Sylvania Research Laboratories using a modified Macbeth Illuminometer and standardized conditions of tube operation.

In this and countless other continuing researches in picture tube design and performance, Sylvania's tube customer and the set owner himself reap benefits scarcely to be measured. Without such fact-finding and engineering research, television would be far from the practical, enjoyable, economical method of mass communication which it is today.

LARGE AREA CONTRAST

FACE PLATE	NO AMBIENT ILLUMINATION	LOW LEVEL AMBIENT ILLUMINATION
Clear	34.1	23.8
Grey	39.7	34.0
Clear and Frosted	52.4	33.1
Grey and Frosted	61.3	47.3

Here a staff member at the Physics Laboratories of Sylvania Electric Products Inc. is measuring the large area contrast of a television picture tube. Examples of such measurements are given here, showing how the ratio is affected by the color of the face plate, the treatment of its surface and the presence of ambient illumination.

SYLVANIA

Sylvania Electric Products Inc., 1740 Broadway, New York 19, N. Y.

ELECTRONIC DEVICES; RADIO TUBES; CATHODE RAY TUBES; FLUORESCENT LAMPS, FIXTURES, WIRING DEVICES, SIGN TUBING; LIGHT BULBS; PHOTOLAMPS

changed," he stated that "officials estimate that not more than 20% of military electronics contract commitments will be spent for items which can be manufactured in normal mass-production fashion. Included, for example, are radar equipments costing $400,000 which use less than 350 separate components. Obviously, such equipment cannot be assembled on a production line basis. Assembly might be done by a total of 60 people, of whom half must be engineers."

The association is "trying to do something about this situation," Mr. McDaniel declared, including establishment of liaison between large prime contractors and small manufacturers to facilitate more subcontracting, and compilation of information leading to subcontracting opportunities. Discussing civilian products, he brought out that the outlook is "encouraging" for the fall and winter, with increased TV set production anticipated.

Pratt, Telecommunications Adviser

Haraden Pratt, vice president of American Cable & Radio Corp., and one of this country's outstanding pioneers in radio engineering and operation, recently accepted the post of telecommunications adviser to President Truman.

Mr. Pratt is known to have been by far the leading possibility for the newly-created post, recommended by the President's communications policy board, since it was decided several months ago to appoint a single telecommunications adviser rather than the CPB's primary suggestion, a telecommunications advisory board.

It is felt that Mr. Pratt has been given a very difficult assignment, in view of the lack of a cohesive national communications policy, and the absence of a single authority over radiofrequency space. For this reason his selection is regarded as an unusually good one because of his skill in personal relationships, combined with his vast knowledge and background in the radio-communications and engineering fields, both domestic and international.

Hilton and Smith at OPS

Homer Hilton, vice president of the Argus Camera Co., now heads the photographic section, and Earl R. Smith, management engineer of the Connecticut Cabinet Co., the electronics section at the Office of Price Stabilization. Mr. Hilton was formerly with AGFa Ansco Corp., and the Bell & Howell Co. He served as director of the General Products Division, War Surplus Properties, U. S. Treasury, 1944-45, and was a member of the photographic advisory committees of OPA and WPB during World War II. He is a director of the National Association of Photographic Manufacturers and of the Photographic Manufacturers and Distributors Association, N. Y.

Mr. Smith was formerly with RCA and spent eight years with that firm in Japan. Earlier he was works manager for Rockola Mfg. Corp.

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Poutrie Succeeds Hobbs at MB

Colonel Clifford A. Poutrie, former commander of the Yokahama Signal Depot, with the Eighth Army, and since an instructor at the Signal School, Fort Monmouth, N. J., has been named to succeed Marvin Hobbs as chief of the electronics programs office of the Munitions Board. Electronics programs' main tasks are approving production schedules and phased requirements for controlled materiels for the electronics and radio industry and production schedules for the armed services.

DME Demonstrated For Airlines

Representatives of the nation's major airlines were recently made acquainted with the Distance Measuring Equipment Familiarization Program on the Chicago-New York airway at the Nutley, N. J., plant of Federal Telecommunication Laboratories, Inc., research associate of I.T.&T.

The DME equipment, including both ground and airborne units, was manufactured by Federal Telecommunications Laboratories and installed by the Civil Aeronautics Administration along the Chicago-New York airway under the direction of CAA Administrator C. F. Horne. Airborne equipment has been delivered and is now being test-flown at various CAA stations, prior to loan to those air lines which fly the airway. With DME equipment, the pilot of an aircraft, for the first time, will know his exact position at a glance relative to a fixed ground position without guesswork or computation. It will greatly facilitate traffic control and increase the safety of air line operation.

The meeting at the Nutley plant was under the chairmanship of Peter Caporale, chief of the establishment engineering div. of CAA, and featured talks by Leo Wilbur and R. C. Borden, of the CAA's engineering staff, and S. H. Dodington and R. A. Hampshire, FTL engineers.

Electronics Weakness Curbs Reds?

The Soviet air force's deficiency in electronics was given as the basis for a "top U.S. planner's" prediction that there will be no war this year, in a recent *Time* story on the Red air force. "In electronics, Russia is a long way behind the West," states the article. "Gunsights on their best fighters are still World War II types, and their best radar, based on U. S. lend-lease sets and captured Nazi equipment, is out of date. Production is slow, even though the entire Soviet electronics industry is geared for war and not for TV sets. There is only a thin screen of radar stations along Russia's borders. Facilities are lacking for training the necessary operators and maintenance men."

Monmouth OCS Re-established

The establishment of an officers candidate school at the largest Signal Corps training center in the nation, Fort Monmouth, N. J., which began operation Sept. 1, will initially mean

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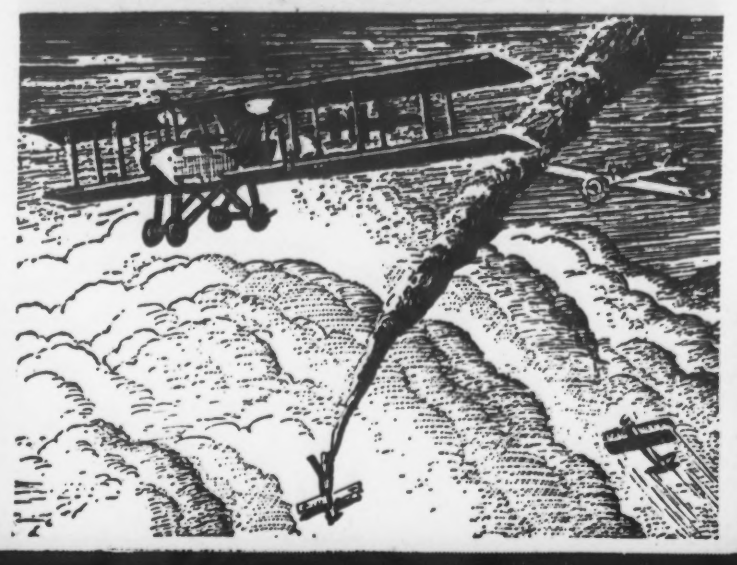

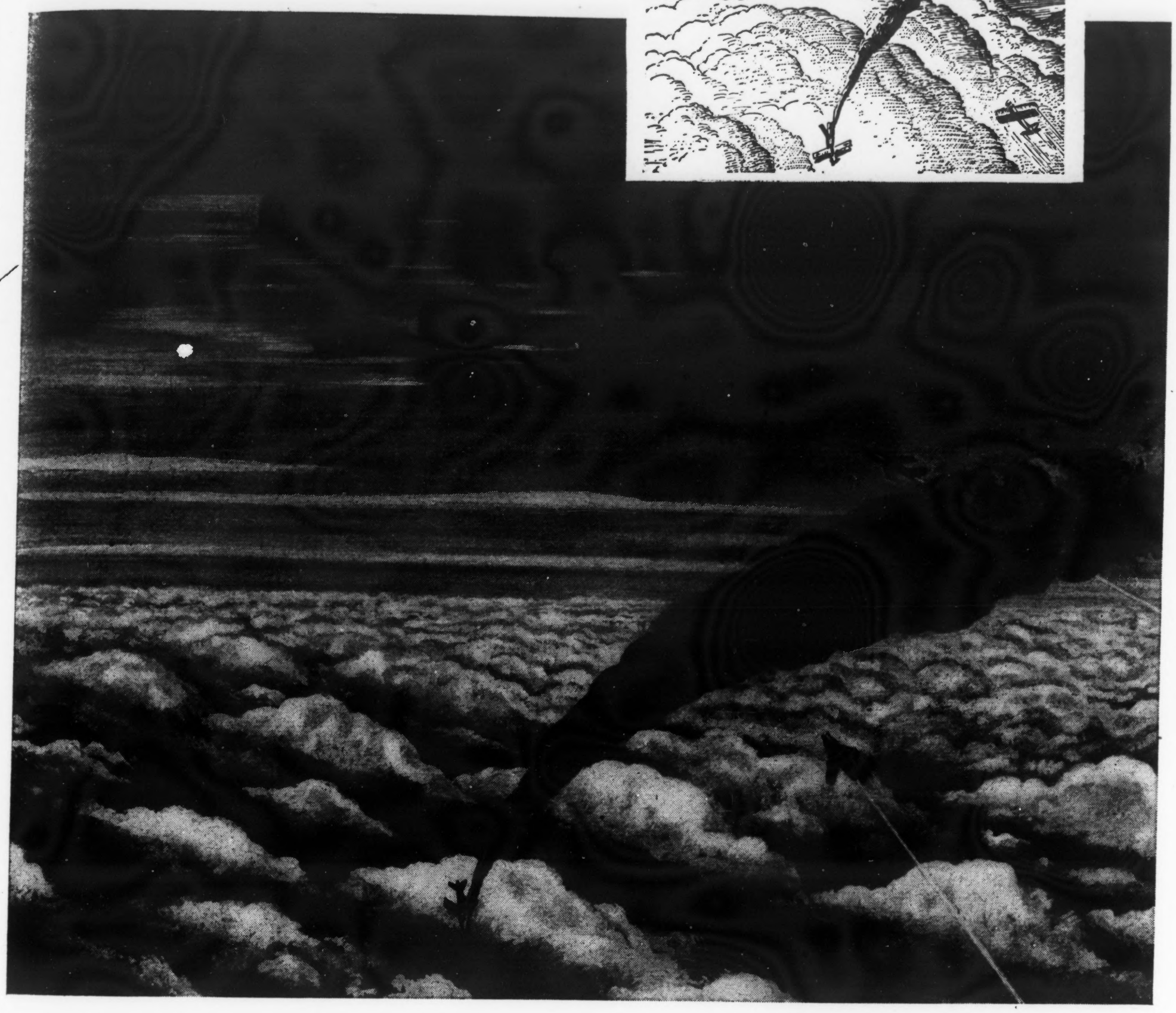

Today's speeds demand electronic gunnery

Today, with interceptors capable of closing in at blinding speeds, the problem of effective gunnery for bomber protection becomes increasingly acute. Split-second tracking, computation and firing are demanded — and complex, compact, light-weight electronic instruments furnish the answer. Arma — working closely with our Armed Forces since 1918 — has supplied the outstanding engineering, imaginative design and precision manufacture that play a leading part in producing these miraculous instruments.

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QUALITY ARMA PRECISION
INSTRUMENT

the graduation of 500 new Signal Corps officers for the first year. Beginning in Jan. 1952 with expanded capacity of the OCS training, there will be a capacity of 650 new officers a year.

The officers candidate school at Ft. Monmouth, which has not been in operation since World War II, has a 22-week course. The initial capacity, when the course started Sept. 1, was 385 officer candidates with an input of 35 candidates every two weeks.

Army Language School

During World War II, and in the postwar years, American servicemen were stationed the world over and many had to acquire some knowledge of a foreign language in a comparatively brief time. From teaching experiences in that period much has been learned on how to quickly train service personnel to a high degree of fluence in a foreign language. One result is the discarding of the old-fashioned lecture method with emphasis on grammar.

At today's Army Language School students begin the first day of learning a foreign language with conversation in simpleset terms. As they progress they are shown movies with the foreign language dubbed in. Soon they begin to read short cartoon captions. The classes, limited to eight students to insure individual instruction and small workable groups, prepare skits on subjects like parachuting into enemy territory or shopping in the local marketplaces, thus exercising their growing vocabularies. Eventually the students become familiar with complex military. technical and diplomatic terminology.

Begun ten years ago with an enrollment of 60 students in one language, Japanese, the school now offers 24 languages—Chinese (both Mandarin and Cantonese), Japanese, Korean, Albanian, Arabic, Bulgarian, Czech, Greek, Hungarian, Persian, Polish, Serbo-Croatian, Turkish, Danish, French, German, Italian, Norwegian, Portuguese, Roumanian, Spanish, Swedish, and Russian.

Difficult languages such as Korean or Russian are offered in 46-week courses. Twenty-three weeks are devoted to European tongues such as French, German, or Swedish.

The school qualifies its graduates for duty with attaches to foreign governments, military missions, occupation forces, and combat units. Graduates often go on immediate duty as interrogators and translators for military intelligence.

Every Army branch which has a need for trained linguists is authorized a quota of students at the language school, and all personnel interested in learning a foreign language are encouraged to attend the school.

To qualify as students, officers must have two years of service remaining upon completion of the course, and enlisted men must have one additional year to serve. They must be U.S. citizens, must pass the general educational development test at the high school graduate level. and must have a knack for languages.

Applicants for the school are referred to DA Letter AGAO-S 210.63 dated 28 June 1951. They should apply through regular command channels.

In an exchange of assignments, Brigadier General Wesley T. Guest has become chief signal officer of the Eighth Army, while Colonel Emil Lenzer has moved into General Guest's former post as director of the plans and operations division, Office of the Chief Signal Officer, Washington, D. C. Shown here in Korea, Col. Lenzer, who is now in Washington, orients his successor.

Combat Cameraman's Story Aids Blood Donation Campaign

An incident in the Korean fighting, related by Captain Bob Strickland, Signal Corps combat cameraman, is being used by the Defense Department, in a printed folder, to aid in the current campaign for blood donations. The reserve supplies of blood plasma, says the Defense Department, have been completely exhausted, and the present shortage is so serious as to constitute an emergency.

Strickland, in his story, tells of riding with a badly wounded "buddy" to a rear-area hospital. The hospital was finally reached after an hours-long ride over muddy roads and broken down bridges crowded with military traffic. At the hospital, when the blood-soaked field dressings of Strickland's buddy were cut away, the terrible wound was revealed—most of his right shoulder had been blown away—a piece of jagged metal from a mortar shell was still lodged in his neck. The boy did not complain, he asked if he might have a cigarette. As Strickland relates it, "By the time he had been given the cigarette and had taken one long grateful puff from it, one of the corpsmen was standing beside him with a bottle of blood—a gift of life from someone back home. The doctor stood up and spoke to me. A lot of blood had been lost—by morning they would operate—after that my buddy would recover rapidly, thanks to a ready supply of blood for the transfusion. I spent the rest of the night there in the hospital. . . Every few minutes, all through the night, one of the corpsmen would come back to get more blood for the wounded, the wounded who kept coming in a steady stream. I decided that night that some way I was going to say thanks to you for the blood that saved my buddy's life. That night, in that bomb-blasted building, I saw my buddy literally brought back to life by the blood which you gave."

Contact Your Nearest Blood Donor Center

Give Blood—Save A Life

British Honor Fernandez

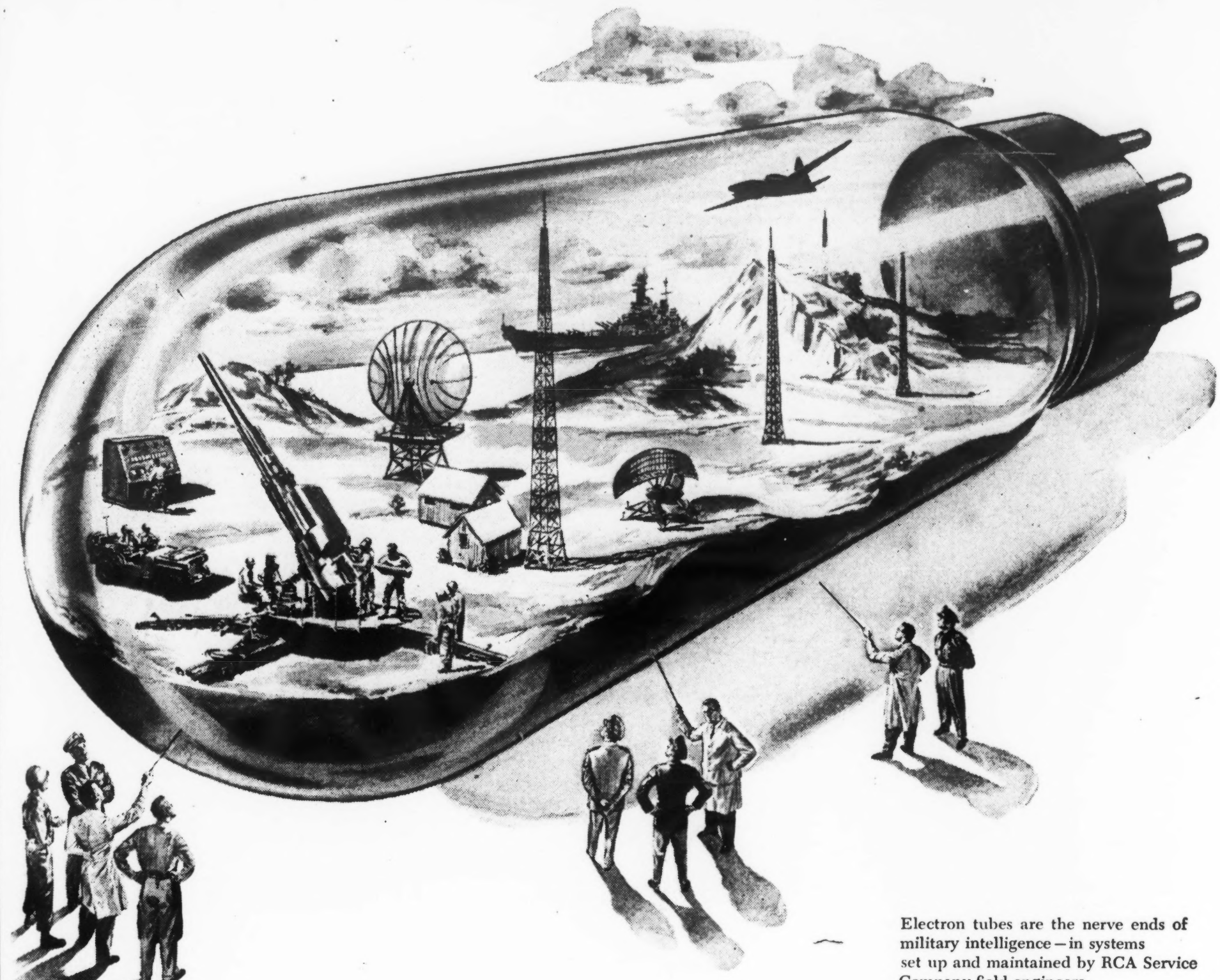
His work in coordinating British and American signal activities in the Berlin airlift has earned Colonel Manuel "Pete" Fernandez, deputy director of communications for the U.S. Air Force in Europe, the Order of the British Empire. The presentation was made at Gutersloh Airfield, British Zone, Germany, by Sir Irvone Kirkpatrick, British high commissioner for occupied Germany.

A similar award was made to Colonel Hernandez by the Chinese government for his communications work on "The Hump" airlift.

Colonel Fernandez returned to Europe recently from the Far East where he had set up communications for the Combat Cargo Command which is operating a Japan-Korea airlift.

Cousins Named Info Director RTMA

P. H. Cousins, who has been director of publications since 1946, has been appointed director of information of the Radio-Television Manufacturers Association. Before he came to the RTMA Mr. Cousins served with the American Broadcasting and National Broadcasting companies, and prior to that was on the editorial staff of *Telecommunications Reports.*



Electron tubes are the nerve ends of military intelligence—in systems set up and maintained by RCA Service Company field engineers.

Electron Tube with a military mind

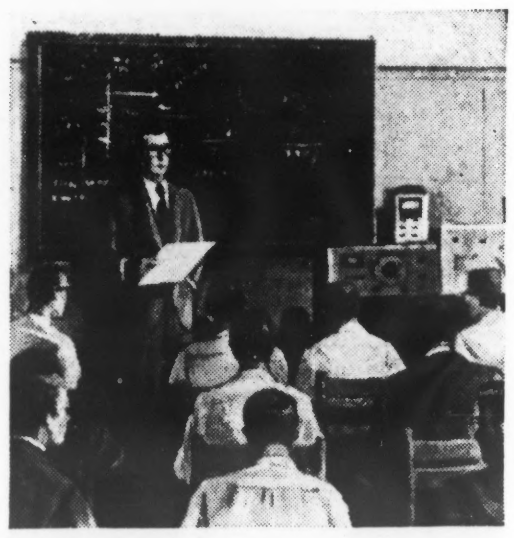
With the rapid advance of airplanes, tanks, fast ships, and mechanized weapons of war, a swift, sure means of *communication* and *detection* is as important as are the new weapons themselves. It is provided—by electron tubes and electronics.

So important is this area of military intelligence that RCA Service field engineers—here and abroad—have lifted their efforts to new peaks. Working with our Armed Forces, they install and maintain such *communications systems* as short-wave radio and portable radiotelephones. They work with systems of *detection*, such as radar. They help ships and planes *navigate* with loran and shoran. These engineers are the link between research developments made at RCA Laboratories—and America's military strength.

The number of RCA field engineers has *tripled* since World War II. And they serve where needed, wherever an electron tube's "military mind" can be of military use.

* * *

See the latest wonders of radio, television, and electronics at RCA Exhibition Hall, 36 West 49th Street, N.Y. Admission is free. Radio Corporation of America, RCA Building, Radio City, N.Y. 20, N.Y.



Practical training of military personnel—in classes, factory, and the field—is a basic part of RCA Service Company's work with our Armed Forces.

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AFCA Industry Group Member News

American Chemical Paint Co.

Lithoform makes paint stick to galvanized iron and other zinc and cadmium surfaces. *Alodine*, a new protective coating chemical for aluminum anchors the paint finish and protects the metal painted or unpainted. *Granodine* forms a non-metallic, crystalline zinc phosphate coating which bonds paint to metal, inhibits the spread of under-finish corrosion, and thus protects painted steel from rust-damage. For descriptive folders about these products write to Norman P. Gentieu, Technical Editorial Dept., American Chemical Paint Co., Ambler, Pa.

Bendix Aviation Corp. Radio Division

John Siena has been appointed staff assistant to the director of industrial relations. Siena formerly served as engineering personnel and conducted employee ing supervisor in the selection of engineer-training.

Gordon R. Badger has been promoted to assistant chief engineer of test and inspection. Prior to his most recent promotion he served as administrative assistant to the chief engineer of test and inspection.

New "welcome booklet" gives inside tips on who to see, how to get where you want to go and what to do while visiting Bendix Radio—helps to make a visit there more efficient and enjoyable.

CENTRALAB, Div. of Globe Union, Inc.

Centralab announces New Miniature Switches. These unusually small rotary switches with phenolic insulation are available in a variety of multi-pole, multi-position, multi-section types . . . also in combination with A.C. line switches and variable resistors. *Printed Electronic Circuit Guide No. 1*, the world's first replacement guide for service engineers has been published. Lists 269 printed circuit plates as used by 69 manufacturers. Handy cross-reference chart makes it easy to select replacements. Free copies obtainable from local distributors or by writing to Centralab, Div. of Globe-Union, Milwaukee, Wis.

Federal Telephone & Radio Corp.

A new series of radio sets which give faster and more flexible communication for troops in the field is now being built by Federal Tel & Radio (an IT&T associate). Designed for use by the Signal Corps, the new units can be combined to form as many as 30 different radio sets. With a range of approximately 15 miles for each set, two sets can be linked together for automatic retransmission of voice messages over longer distances. This will more than cut in half the time required to transmit messages under combat condition over relatively long distances. Included in the 20 standard assemblies are sets for each of the combat arms—infantry, armor and artillery—with provisions made for intercommunication between the sets used by different arms. Designed primarily for vehicular use, the new radio sets may be modified readily with a field set for operation on the ground. They are men-transportable and supplement the new walkie-talkie and handie-talkie radios, recently announced developments of the Signal Corps.

General Electric Co.

The government division of GE's electronic department has opened an office in Dayton, Ohio, to serve requirements of the Air Force for electronics equipment. Roy L. Merwin will be in charge. Mr. Merwin served as an electronics officer in the Army Air Corps from 1942 to 1946 and subsequently joined the GE organization as a field engineer.

Formation of an application engineering section within GE's government sales dept. and appointment as its manager has been announced. The new section will work closely in the field with all branches of the armed services, assisting them in the use of present electronic equipment and locating possible applications for which new devices might be developed. Mr. Nelson served during 1941-42 as a research associate in the radiation laboratory at MIT, engaged in microwave research. Following four years as a development engineering officer in the Air Force, he joined GE and in 1949 was appointed sales manager for Air Force equipment.

Genisco Inc.

Genisco has announced the new *"G" Accelerator*, a testing machine which fulfills the need for a means of accurately and conveniently applying a steady force of variable magnitude to instruments and component parts for aircraft and guided missiles. Also announced is the *Analog Digital Converter*, a new counting device intended for use where a mechanical motion, rotation or displacement is to be broken into discrete steps or divisions, and the divisions are to be accumulated and visually indicated and/or recorded in arabic digital form. For detailed information bulletins, write Genisco Incorporated, 2233 Federal Ave., Los Angeles 64, Cal.

The Haloid Company

Joseph C. Wilson, president, has announced the election of Sol M. Linowitz to the company board of directors. Mr. Wilson said that Linowitz would continue to serve Haloid in all legal problems relating to Xerography, as he has done for several years. During World War II Mr. Linowitz served as legal aide to Secretary of the Navy James Forrestal, and received national recognition for his work with the Office of Price Administration in 1942 and after the war.

Hoffman Radio Corp.

Military gear exhibit was displayed by Hoffman Radio Corp., Los Angeles, at the 7th annual Pacific Electronic Exhibit in the San Francisco civic auditorium the last week in August for a three-day run.

Berkeley L. Fuller, head of the Hoffman special apparatus division and its Washington, D. C., representative in World War II, was on hand with a group of engineers to explain the workings of the individual electronic items.

Though the exhibit was not open to the general public over 8,000 attended, including men from the military establishment, technical laboratories, industrialists, manufacturers, and students.

According to Fuller, the major interest at the Hoffman booths was in the air and sea rescue transmitter-receiver, AN/URC-4. However, nearly as much interest was given to the frequency shift converter-comparator AN/URA-B8 and the radio test set AN/URM-30 and the audio amplifier AM/215-A/U.

The Hoffman group, longtime prominent in development and engineering and in production on gear for the military establishment, also makes direction finders, instruments, radar, sonar, countermeasure and research and development, in addition to its TV line for the civilian market. It maintains seven plants in Los Angeles and Pasadena.

International Resistance Co.

Tiny Type WW-10 Resistor, IRC's latest contribution to miniaturization, is only 13/32" in body length and 9/32" in diameter, but still provides a high degree of precision. Available resistances range from 10 ohms to 0.160 megohms, and tolerance is 1%. Type WW-10's have a rating of 0.15 watt at 85°C. ambient temperature, and a maximum temperature coefficient of 0.0025% per °C. from 20°C. to 100°C. Maximum voltage is 150V. New *Continuously Variable Loudness Control, Type LCI* is said to be revolutionary in the continuously variable audio-compensated control, as opposed to former single or double tapped, or stepped-type controls, and provides greater smoothness of adjustment to any desired level from a whisper to a shout. Easy to install, requires only three connections. New Catalog Bulletins now available provide comprehensive data on construction, specifications, performance, characteristics, etc. *Bulletin A-2* for IRC Type W 2-watt Rheostat Potentiometer; *Bulletin A-4* for New Type Q Control; *Bulletin B-1* for Type BT Advanced Fixed Composition Resistors—⅓—½—1 and 2 Watts; *Bulletin B-5* for Type BW Insulated Wire Wound Resistors; *Bulletin D-2* for IRC Sealed Precision Voltmeter Multipliers; *Bulletin F-2* for unique IRC High Frequency-High Power Resistor for television, FM and dielectric heating applications. To obtain Catalog Bulletins or information on new products, write International Resistance Co., 401 N. Broad St., Philadelphia 8, Pa.

Lewyt Corporation

Because of his activity as vice-chairman of the New York City anti-crime committee, Alexander M. Lewyt, pres. of the Lewyt Corp. has been given the first Public Service Award of Merit by the *Civil Service Leader*, official organ for public employees. This award was made by Harold Keller, Commissioner of Commerce of the State of New York.

The French Signal Corps technical mission recently visited the Lewyt plant, Brooklyn, N. Y., to study American production techniques on military communication equipment.

After the tour Col. Edmund P. Combaux, chief of Armament Telecommunications Service, stated "It is marvelous to observe the converting of peacetime products into necessary defense material." Visits to various military installations and other manufacturing plants were planned.

Magnecord, Inc.

Magnecord, makers of magnetic tape recording equipment for professional use, have issued an *Illustrated Catalog* to describe the versatility of their line and make known their facilities for building special equipment to individual requirements. Can be obtained by writing Magnecord, Inc., Department SC-5, 360 N. Michigan Ave., Chicago 1, Ill.

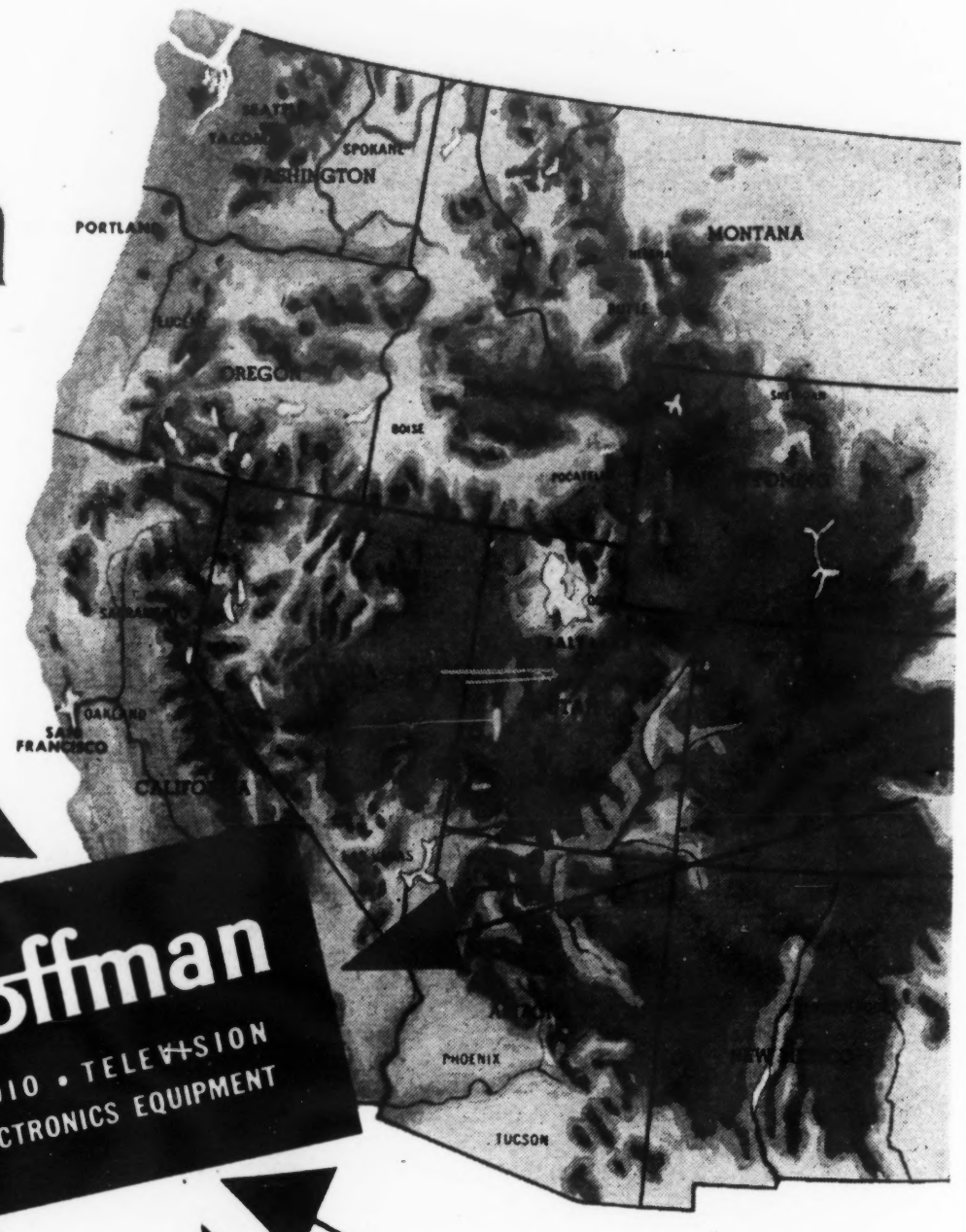
Philco Corporation

From the sands of Saudi Arabia to the battlefields of Korea, Philco TechReps are playing an essential role in keeping vital electronics and communications equipment operating according to Robert F. Herr, vice pres. Several have been awarded the Legion of Merit, highest civilian decora-

IN THE WEST—

IT'S Hoffman

FOR ELECTRONIC EQUIPMENT



From the research and development laboratories of Hoffman in Los Angeles come advanced circuits—new concepts of radar, sonar and other electronic devices. The combination of top research-engineering and manufacturing know-how have made Hoffman the leader for government electronic equipment in the West.

HOFFMAN RADIO CORP.

3761 S. HILL ST., LOS ANGELES 7, CAL.

AFCA Group Member News

tion, for efforts beyond their regular duties.

So extensive is this field engineering operation that Philco now has a special TechRep Division. These field engineers assist armed forces personnel in planning, evaluating, installing, operating and maintaining the widest variety of electronic devices. They also instruct both military and civilian technical personnel. They are trained in the maintenance of devices produced by all electronic manufacturers.

With the increased emphasis on electronic equipment in the national defense program, Philco TechReps form the vital nucleus of a group that could be expanded considerably in an emergency without loss of efficiency.

Radio Corp. of America

New *Improved Carfone,* intended for highly-selective two-way mobile radio communication in 152-174-megacycle band, features transmitter-receiver unit in popular "Sandwich Case," newly designed speaker, control unit with palm-type microphone, and whip antenna. The equipment develops greater power output, while retaining the 31-circuit selectivity and rev-

Isolated Communications Equipment

(*Continued from page* 13, *col.* 1)

sired point within its line of sight. But the importance of the dependable functioning of the relay tower is so great that stand-by electric power generating equipment is universally used which activates itself in the event of a local power failure. Whenever power is not available locally or where the amount of available power is not sufficient, two gasoline engine powered generator sets are often used alternately, the idle one serving as a standby unit.

A number of these gasoline engine powered generator sets are in operation between New York and Boston, Toledo and Detroit, Chicago and Milwaukee, Cincinnati and Dayton, Dayton and Columbus, Buffalo and Rochester, Albany and Syracuse, with Hercules engines playing part in their dependable operation.

Now, with the expansion of television westward into more isolated and sparsely settled areas, with limited power supply, the unusual merits of the diesel engine as a means of dependable, economical power have been given wide and serious consideration. Because diesel engines have proven to be the most practical solution for future uninterrupted microwave tower performance, there resulted the development of a generator set powered by the Hercules Model DJXH six cylinder diesel engine. This model, with a 3¾" bore, 4½" stroke, and piston displacement of 298 inches, was developed primarily for maximum reliability and smoothness of operation, combined with the high economy inherent to diesel engines.

The first installation of Hercules diesel engine powered generator sets at a microwave relay station was at Omaha, Nebraska, and consists of 4 units. This station has been providing TV service between Omaha and Chicago and now flashes telephone as well as television signals east and west from Omaha. Other installations have recently been completed, or are planned in connection with the extension of TV relaying equipment through Utah, Nevada, Virginia, Alabama, Mississippi, and throughout Texas. These plans include the installation of two Hercules diesel powered generator sets at Cedar Mountain, Utah, two at Barrows, Utah, and two at Wendover, Nevada. Similar type equipment is tentatively planned for connecting Pittsburgh and Columbus and between Detroit and Cincinnati. Where localities do not have a power supply, these units can be used to operate the television broadcasting station itself.

Present uses of the microwave relay towers are believed by many officials in communications to represent only a fraction of their potential usefulness in the years ahead.

Automatic Communications

Another power problem solved by Hercules Motors Corporation in conjunction with the Signal Corps Engineering Laboratories was the development of a Hercules engine to be used as the prime mover of an engine-generator set that operates automatic communication equipment in relatively inaccessible locations where altitudes up to 10,000 feet above sea level are encountered.

The Hercules Model ZXB 4-cylinder gasoline engine of 2⅝" bore x 3" stroke and with a piston displacement of 65 cubic inches is used for this service incorporating specific requirements as set forth by the Signal Corps Engineering Laboratories. In addition to the engine as used heretofore, a special carburetion system including carburetor, manifold and automatic choke, an enlarged oil pan and a special engine oil filtering system is incorporated.

These engines are required to operate 500 hours or more over periods which may extend as much as six months. Each engine is required to function on U. S. Army standard fuel and lubricating oil and operate within an enclosure with a minimum ambient temperature of 40 degrees F. and the maximum ambient temperature will be 130 degrees F.

The duty cycle will vary from 15 minutes every three hours to nearly continuous operation. The carburetion must provide repeated starts under all conditions of ambient and engine temperature without danger of flooding, oil dilution, or fouling of spark plugs. The automatic choke must work on the thermal-vacuum principle with provisions to prevent fuel from reaching the choke.

The oversize oil pan is divided into two different sumps. These primary and secondary sumps are interconnected by means of a thermostat. The oil in the primary sump is brought up to engine operating temperature and maintained at this temperature by the transfer of cooler oil from the secondary sump. This transfer of oil is governed by the thermostat, which has been set to open when the oil in the primary sump comes up to the desired operating temperature. Therefore, the secondary sump actually acts as an oil cooler.

The Model ZXB engine has been in the Hercules line of gasoline engines for a number of years and is one of the most popular 4-cylinder engines. During the war more than 70,000 were used for the Signal Corps, Engineers, Ordnance and Quartermaster Corps and it has an excellent record for dependable overseas service where it was subjected to the severest kind of operation. Simplicity in design eliminates everything not essential and reduces moving parts exposed to wear to a minimum. It is a strong, powerful engine that reflects a scientific selection of proper materials and alloys. Liberal cooling areas, pressure lubrication and an accurately machined, heat treated and carefully balanced (dynamically and statically) crankshaft assures smooth, vibrationless operation. Easily removeable cylinder head, a gear type oil pump with an easily adjusted regulating device, heavy-duty type pistons and deflection-free camshaft are other important Hercules features. Ample power reserve is built into the standard engine to master unforeseen power loads, which is a valuable safety factor.

Today, Hercules Motors Corporation produces an extensive line of both gasoline and diesel engines that can easily be adopted to most applications. Gasoline engines of the L-head type are available in 2, 4 and 6 cylinders, 16 series and 35 models, with piston displacement ranging from 39 to 935 cubic inches. The Hercules solid injection, compression ignition, 4-stroke cycle diesel engines are comparable in BMEP with the better types of gasoline—14 series and a total of 29 models. A range of power from 12 to 500 horsepower is available and piston displacements start at 113 cubic inches and reach a maximum of 1468 cubic inches, offering a wide choice to meet varying requirements.

built to TUNE IN THE WORLD!

In 2 Easy Steps...

1 Flip on crystal CALIBRATION OSCILLATOR. Continuous tone signals will be heard at exact 500 kc intervals from 2000 kc through 56000 kc.

2 Use RESET CONTROL to adjust dial pointer. Coincide with exact frequency of this test signal.

YOU'RE THEN "ON FREQUENCY" WITH PIN-POINT ACCURACY. IF DESIRED STATION IS THERE TO BE HEARD—YOU'LL BRING IT IN!

"The GLOBEMASTER"

SX-62

The only Radio with all these features

- **High-fidelity reception** on all wave bands—Standard Broadcast, FM and Short Wave.
- **World-wide frequency range,** with continuous coverage from 540 kc through 110 Mc, AM or FM!
- **Flexibility of control,** with six degrees of selectivity, separate sensitivity and volume controls, plus automatic noise limiter and beat frequency oscillator.
- **Ease of tuning** with hair-line accuracy. Six broad scales with over 150 stations marked; calibration oscillator for checking frequency as explained above.

There's a Precision Hallicrafters for you from $44.50 to $289.50

hallicrafters

"The Radio Man's Radio"

WORLD'S LEADING MANUFACTURER OF *PRECISION* RADIO & TELEVISION • CHICAGO 24, ILLINOIS

olutionary transducer modulation control which makes possible adjacent-channel operation designed to exceed all RMA and FCC requirements. New free booklet, "*2-Way Radio for the Transportation Industry*" covers basic "Fleetfone" systems available for service in the 30-50 megacycle band, tells how to obtain a permit from the FCC, contains helpful information to determine whether it is practical to use two-radio for any particular application. Address requests on a company letterhead to Advertising Section, Engineering Products Dept., RCA, Camden, N. J.

Military and other government training and information specialists can now record their own commentary on 16mm films inexpensively and without laboratory processing by using the new RCA "400" magnetic sound projector.

The instruction officer, for example, can record commentary while seated in his office by simply speaking into a hand microphone as he watches the picture unreel on the screen. He can play back all or any part of it at any time by merely throwing a switch. If any change or correction is desired, he can switch on an electronic "erasing" device which will automatically blank out the portion to be revised as he records the new version.

According to RCA officials, the new equipment achieves a new realism because it permits the recording and reproduction of sound over a frequency range of 80 to 7200 cycles, and because background noise is virtually eliminated.

By a new film process a stripe of magnetic oxide 1/10th inch wide can now be coated on the edge of a 16mm film economically, either before or after picture-taking and even if it already has an optical or photographic sound track. Hailed as the most significant advance in the 16 mm field since the introduction of synchronized sound, the new technique permits quick recording on any single-perforation film to which the magnetic track has been applied.

The same picture can be presented with two or more different sound tracks—in several different languages, for example.

The cost of recording a 400-ft. reel has been estimated to be only about one-third of the cost of achieving comparable results photographically, and film waste due to recording errors is eliminated. The new equipment can also be used to reproduce optically recorded sound.

The French Signal Corps technical mission, in the U.S. to study American production techniques, included in their tour a visit to the Lewyt Corporation plant in Brooklyn. The company's president, Alexander M. Lewyt, shown here, conducted officers of the mission through the plant.

Technical writing facilities of the RCA Service Company's Govt. service division are being made available to electronic equipment contractors and military agencies under a program known as "Operation Techmanual." Projects the division will undertake include the preparation of instruction books, technical manuals, training aids, and special reports and presentations.

A 500-watt television transmitter to serve residents on both sides of the Rio Grande Valley was recently purchased from RCA by a group of businessmen. The new station, to be erected at Matamoros, Mexico, across from Brownsville, Texas, was scheduled to begin broadcasting in September with the call letters XELD-TV. Manager Monte Kleaban plans to transmit most programs in English. Owners include Romulo O'Farrill, Sr., who operates XHTV in Mexico City, first television station to go on the air in Latin America.

"*Ships That See In The Night*," a 30-minute, 16-mm, color-sound motion picture on marine radar has been released by Radiomarine Corp., a service of RCA. It traces the development of marine navigational aids, explains the principles of a radar system and the interpretation of radar scope presentations. Prints are available on loan to maritime, profesisonal and industrial groups. Make requests on letterhead to the attention of Gerard E. Nistal, Advertising and Promotion Mgr., Radiomarine Corp. of America, 75 Varick St., New York 13, N. Y.

Ray-O-Vac Company

Inventive genius and electronics came to the rescue when it was learned that William W. Cargill, chairman of the board, could not be present to address a recent meeting of Roy-O-Vac officials. A tape recording had been made of his speech, but officials ran into a snag when they learned that Mr. Cargill had planned to illustrate his talk with slides. A solution was improvised by devising a method to synchronize the slides with the talk through the use of an electronic device which changes the slides by using an ultra high frequency "bong" that the human ear cannot detect. So far as is known, such a combination of mechanics and electronics has never before been used.

Raytheon Mfg. Co.

Raytheon announces series of newly designed standard control knobs. Utilizing materials and configurations commensurate with highest quality electronic equipment, the knobs are compatible with current government specs. Available in matched sets of round, pointed, dial, and crank knobs, in the various size ranges, their utilization,

Gray Audograph

(*Continued from page* 36)

the components to expensive, close tolerances.

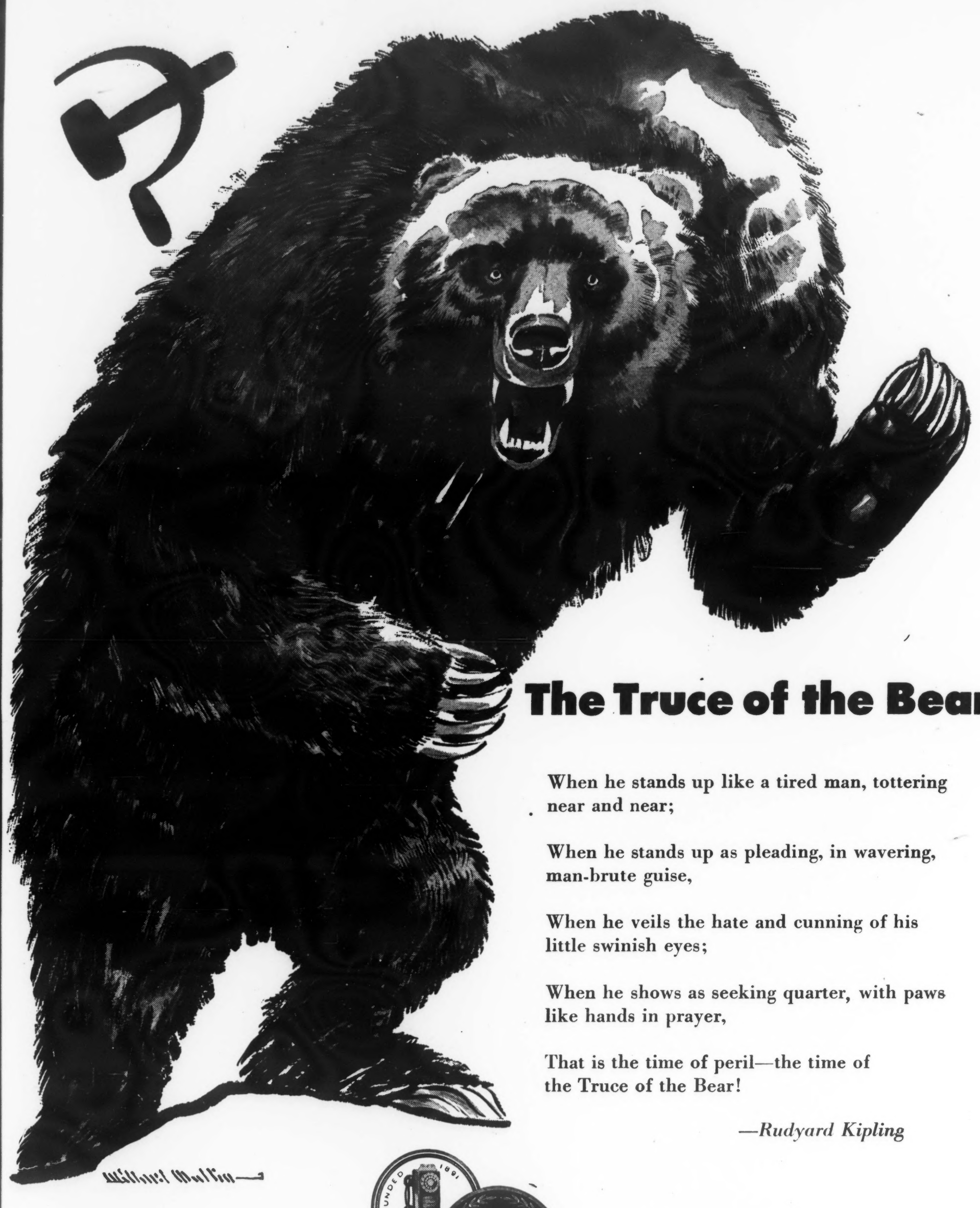
The electrical switching mechanism for automatically selecting the reproducing and recording functions of the amplifier consists essentially of a multipole switch. The original leaf-type model required adjustment after installation, and had to have a guard attached to it to prevent injury to the leaves and disruption of the adjustment while passing through production. The new type has a two-piece bakelite body, solid silver contacts, and a self-cleaning, wiping action. Correct contact pressure is established when the switch is made, so adjustments are not required and guards are unnecessary. The change resulted in a 30% reduction in material cost, a 25% reduction in labor cost, and eliminated all field service on this particular item.

The increasing efficiency of the organization is reflected through the wage incentive plan at the plant. An excellent example is found in the case of the recorder reproducer sub-assembly. Here a marked reduction in manufacturing costs has been achieved although operators' take home pay has steadily increased.

The original production incentive plan, installed in 1948, was based on straight piece work and consisted of forty-nine separate elements requiring a total of .77 hours for a complete subassembly. The average bonus for operators was about 15c per hour. Through the cooperation of engineering and time-study departments, an assembly line was developed in 1949 which reduced the necessary productive elements to forty-one, requiring only a total of .65 hours for complete subassembly. The average bonus for operators amounted to approximately 25c per hour.

Further improvements in jigs, fixtures and assembly methods were brought about early in 1950. The number of productive elements was again reduced, this time to thirty-five, requiring a total sub-assembly time of only .50 hours. The average bonus for operators amounted to approximately 35c per hour.

In spite of these tremendous strides which Gray has made, Gray feels that only the surface has been scratched in the dictating machine industry. Large-scale training programs must be introduced in schools throughout the country to train secretaries and executives alike to the benefits of using and working with dictating machines. Almost daily new advantages of working with the Audograph are reported to Hartford—These became so numerous that recently the company printed a list of more than 100 different ways in which the Audograph could be used and this list did not include the more remote uses found in specialized fields.



The Truce of the Bear

When he stands up like a tired man, tottering near and near;

When he stands up as pleading, in wavering, man-brute guise,

When he veils the hate and cunning of his little swinish eyes;

When he shows as seeking quarter, with paws like hands in prayer,

That is the time of peril—the time of the Truce of the Bear!

—*Rudyard Kipling*

DUTY HONOR COUNTRY
LABOR BUSINESS GOVERNMENT

FOUNDED 1891
AUDOGRAPH

Walter E. Dituars

President, The Gray Manufacturing Company
Hartford, Connecticut

Education 1951 Ad

(*Continued from page* 34, *col.* 3)

system. The whole "gimmick" is that everything is arranged so that he can *see* and *understand* what is happening.

Another kind of training aid is used to teach visually basic electrical phenomena, such as the aid which resembles an ordinary table in general outline and construction. A basic electrical circuit is painted on the flat table surface and the actual components are mounted in their corresponding positions on the painted circuitry. The instructor uses the associated switches to explain graphically the effect of the laws which concern direct and alternating current. Here again, while this particular aid may not appeal directly to an emotion, the student can *see* what happens when one impresses direct or alternating current upon electrical items, such as resistors, condensers, and inductances. Also, it is comparatively simple for him to comprehend the difference in the behavior of the two types of current.

The Signal School makes further utilization of the emotional urges of students by employing aids that are based upon a person's desire to know "what makes a certain thing tick." Surely many of us are familiar with the interest and fascination generally aroused in the average person by this technique. A commonly known example is a leading car manufacturer's practice of exposing the mechanical operations of the car's engine by use of transparent material in the housing and hood assemblies.

An operating mock-up of a radio transmitter is one instance where the School uses this idea to great advantage. To attempt to teach a student about this transmitter by using schematic drawings (a drawing showing the physical arrangement of the wiring and the electrical components) is not enough. Nor does the additional use of the actual radio transmitter under study provide a completely satisfactory learning situation. Then one answer is to have an aid that combines the features of both, *plus* simplicity and definite identification with the actual radio transmitter in the way the aid is constructed. It must be built so that it can be used to teach all of the features of the transmitter; namely, the mechanical, the electrical, and the physical facts. As one such aid in instructing students on a standard military transmitter, the training aids branch of the school has constructed a large display type of aid on which the true circuits of the transmitter have been painted (as they appear in a schematic drawing of the transmitter). The actual electrical components have been connected as they are in the actual transmitter, so that the aid performs in the same way as the radio transmitter itself. The extreme teaching advantages of this instructional item can be seen from the photographs of this and the other aids which have been discussed.

Perhaps nothing much new is used at The Signal School in connection with the development of educational methods and techniques and training aids; perhaps it is really only a new emphasis on known requirements and training aids which have been developed. Moreover, training aids, accelerated learning, and other training innovations can never replace the concentration of attention on protracted technical performance so necessary to the production of highly skilled specialists. The teaching techniques and the use of advanced training aids are intended as refinements and supplements to a student's course of study, which, together with his subsequent field experience in his specialty, help us to provide the Armed Forces with well-trained technicians in a minimum amount of time. But I do believe that the purposeful and incisive emphasis on allowing a student's professional capabilities to control his progress and on training aids which appeal to the emotions, is new. At any rate, it is encouraging to note that the failure rate of students has been reduced from 14.9% in 1948 to 3% in 1950.

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AFCA Group Member News

Raytheon points out, will afford savings over the current practice of special knob design, tolling, and production.

Dr. Ivan A. Getting, former professor at MIT, has been elected vice president for engineering and research of Raytheon. For the past year Dr. Getting, an outstanding authority on radar, had been chief scientist of the Air Force. During World War II he headed a laboratory which developed the framous SCR-584, an automatic radar control for anti-aircraft guns which is credited with saving London from the buzz-bombs. After the war he headed a synchroton group at MTI which developed and built a 350 million volt electron accelerator used in atom-smashing. During this period he also served as chairman of the radar panel of the Defense Department's research and development board.

Raytheon's new power tube building, under construction at Waltham, Mass., is nearing completion. The $2 million building, which had its first steel girder set in place last June, following a ceremony attended by company officers and civic leaders, covers 144,000 square feet of space, and is expected to increase Raytheon's employment rolls by 1000.

Remington Rand Inc.

Kard-a-Film, a new record-filing method that gives the space savings of microfilm records and reference benefits of paper and card filing, is announced. While paper contents of a normal file drawer are from 3,000 to 4,000, the same drawer can hold up to 250,000 letter size records on Kard-a-Film. Comes in two types: "Sealed Kard-a-Film" which requires mounting the film in die-cut cards by use of an acetate lamination that seals in and protects the film front and back; "Insert Kard-a-Film" which permits the slipping of filmed images into a slot in the edge of the card. One 8" by 5" card will hold sixty-five 11" by 8½" microfilmed records. Cards for both types available in sizes from 2½" x 3" to 14" x 11". Using a *Kard-a-Film Reader* a full-size copy of any record may be reproduced quickly and easily. For complete information, write to Remington Rand, Inc., 315 Fourth Ave., New York 10, N. Y.

Three New Readers for 16-mm. and 35-mm. rolls of microfilm are now available. These include a portable reader for field and home use, a Library model for viewing extra-large images, and a third known as the Film-a-Record Model 9 for standard office use.

New Record Dexigraph Camera using pre-cut paper photographs documents at any reduction from 100% to 50% of original size on a continuous percentage scale. Up to 150 exposures per hour may be made by the synchronized operation of an electric timer and solenoid shutter, and each exposure is automatically recorded by a reset counter. Besides photo-copying office records, it may be used with Remington Rand's Plastiphotor to make plates for offset duplicating. May be moved on its rubber casters from one office to another and plugged into any standard electrical outlet.

Herbert H. Goodman, branch manager of the Washington, D. C. office of Remington Rand has been made a vice president of the company. He will continue to make his headquarters in Washington. Mr. Goodman started with the company in 1919, came to Washington in 1934, and became senior branch manager in 1949.

Sylvania Electric Products Co.

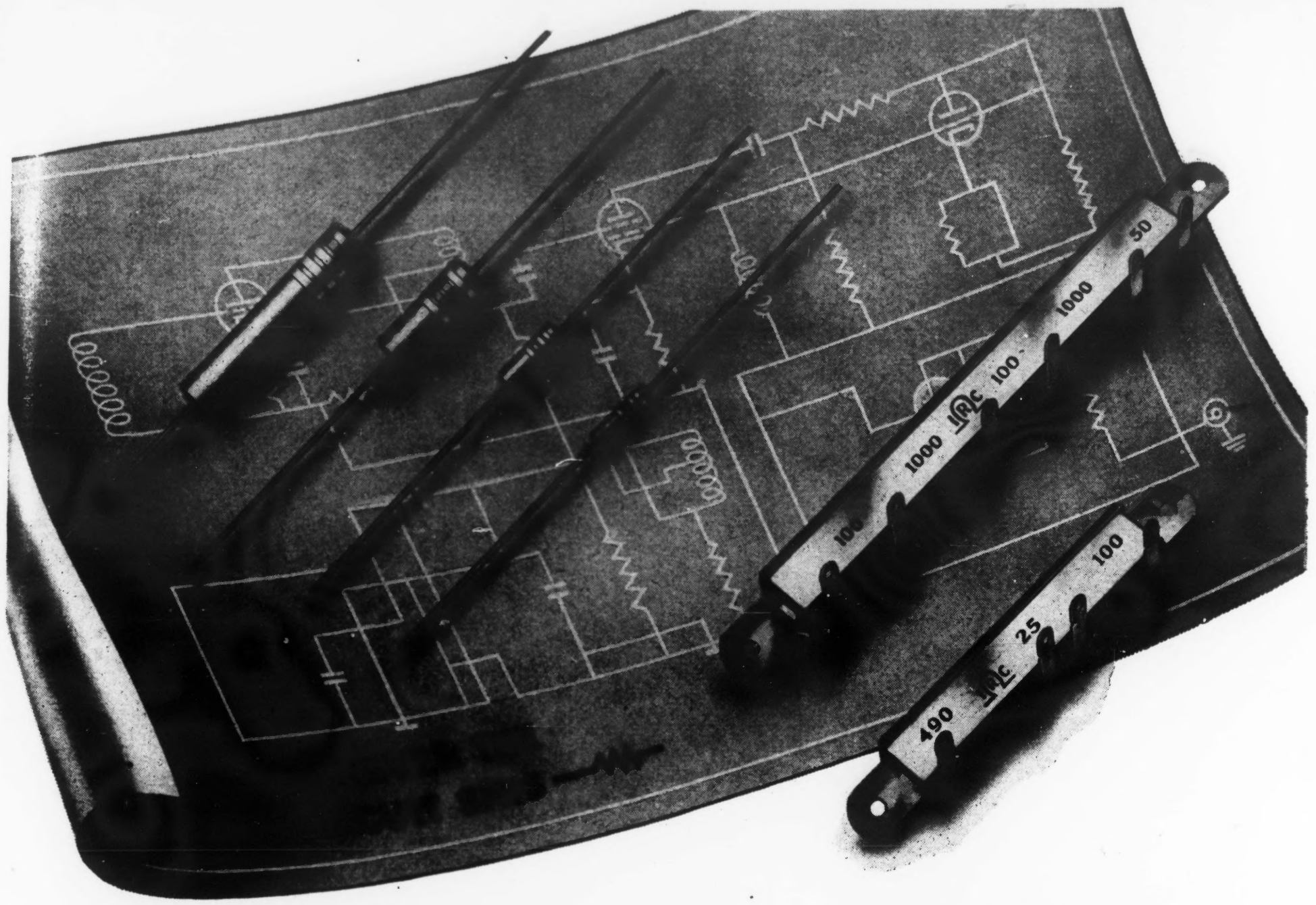
Revised, enlarged, 8th edition of the *Sylvania Technical Manual* comes in new "snap-open" loose-leaf binder so that radio-television servicemen and engineers can easily add or delete data sheets. Contains comprehensive technical data on more than 500 receiving tube types, standard TV picture tubes, as well as 84 pages of general information on vacuum tube operation. Price, $2.00—(new data sheet pages on future receiving tube types issued free to manual holders). Obtainable from authorized distributors or by sending remittance to the Advertising Dept., Sylvania Electric Products Inc., Emporium, Pa.

Sperry Gyroscope Co.

R. E. Erbentraut has been appointed marine sales manager of the Sperry Gyroscope Co. division of the Sperry Corp. A graduate of the U. S. Naval Academy in 1939, Mr. Erbentraut joined Sperry as a marine field service engineer and since 1942 had been assistant marine sales manager. During the war he handled Navy contracts for all marine navigational equipment. Since the war he has been active in introducing marine radar, loran, improved type compasses, and automatic steering controls.

Westinghouse Electric Corp.

Westinghouse has $6,700,000 contract for equipment to carry electric power to new atomic energy plant at Paducah, Kentucky. Included in the contract are large numbers of million-kva circuit breakers—largest ever constructed for use on 161 kv lines. Most of the incoming power will be generated at TVA's Shawnee power station and the Electric Energy Incorporated power station.



HOW VERSATILE CAN SMALL RESISTORS BE?

Critical electronic circuits demand *versatile* resistors —unusual characteristic-combinations. Ever-narrowing space intensifies the need for small-size units. *Can small resistors be versatile enough for your application?*

Shown above are two we are sure will meet your requirements.

IRC Advanced Type BT Resistors have set new performance standards for fixed compositions. At ⅓, ½, 1 and 2 watts, BT's meet and surpass joint Army-Navy Specifications (JAN-R-11) and easily meet the rigorous requirements of television. Exclusive construction features provide extremely low operating temperature; excellent power dissipation; high resistance to aging, humidity and salt water immersion. Yet Type BTR and Type BTS are tiny units—only $^{13}/_{32}$" in body length!

Where wire wound resistors are desired, IRC Type MW's are unsurpassed for adaptability to an extremely wide variety of design requirements. Small, flat design saves space. Low initial cost, lower mounting cost, flexibility in providing taps at low cost—all add up to economy. Mounting bracket actually transfers heat to outside of chassis—for unusually rapid dissipation. Also, the MW may be operated at its full "on plate" rating, whether enclosed or not, without exceeding its rated temperature rise of 100° C.

We'll be glad to send you full technical data on these IRC resistors. Just mail the convenient coupon.

For fast delivery on your small-order requirements for standard resistors, rely on IRC's Industrial Service Plan. It enables your IRC Distributor to give you 'round-the-corner deliveries right from his local stocks. We'll be glad to send you his name and address. International Resistance Co., 401 N. Broad St., Philadelphia 8, Penna. In Canada: International Resistance Co., Ltd., Toronto, Licensee.

Wherever the Circuit Says -WW-

Power Resistors • Voltmeter Multipliers
Insulated Composition Resistors
Low Wattage Wire Wounds • Controls
Voltage Dividers • Precisions
Deposited Carbon Precistors
HF and High Voltage Resistors
Insulated Chokes

INTERNATIONAL RESISTANCE COMPANY

401 N. BROAD STREET, PHILADELPHIA 8, PA.

J. F. ARNDT & CO., ADV. AGENCY

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Please send me additional information on the items checked below:—

☐ Advanced Type BT Resistors ☐ Type MW Resistors
☐ Name of local IRC Distributor

Name _____

Title _____

Company _____

Address _____

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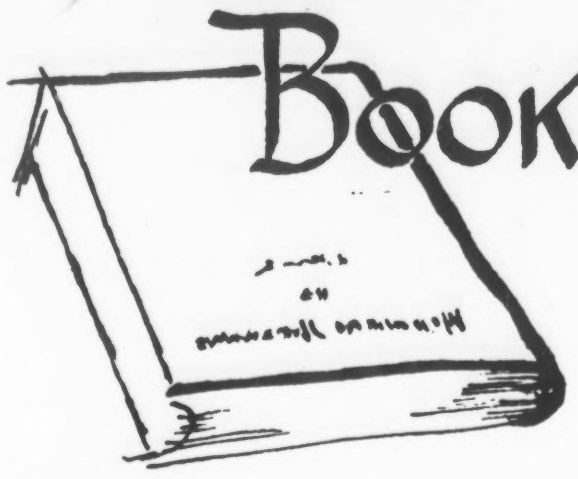
Frank Martins, Mgr.



NATIONAL BEST SELLERS

As listed in Publisher's Weekly for September 1, 1951.

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ORIGIN OF THE UNIVERSE AND THE SECRET OF LIGHT AND MAGNETISM. By Edwin Yates Webb, Jr. Scientific Associates. 120 pages. $5.

This book is provocative—so provocative that we are reprinting parts of it in this issue of SIGNAL (see page 00) and in several following ones. The author believes he has a new, simple approach to the understanding of matter, light, gravitation and magnetism. After a brief introduction and a review of past theories in a chapter titled "Light and the Immortals," Mr. Webb proposes his theory as a basis for the explanation of natural phenomena. He believes that an electric field, to which he gives the name, "Arcandeum," fills the universe.

Mr. Webb states that all the atoms of matter came from this universal electric field, created through nature's atomic piles, the Spiral Nebulae. He advances the theory that in the creation of the solar system the planets moved from the center of a spiral nebula, and that this center is now the sun. He does not believe the planets were hurled from the periphery, nor born of cosmic dust.

In Chapter V (reprinted in this issue) the phenomenon of light, including color and sight, is explained; and in the following chapter Mr. Webb attacks the famous Michelson-Morley experiment. It is around this part of the book that the most controversy is apt to center. This experiment, according to the author, is the only optical experiment not in accord with the hypothesis of a stationary ether, or for example, a universal electric field. He claims the experiment was misconceived and that therefore, the conclusions which were drawn from the results were unwarranted. Since Einstein's Restricted Theory of Relativity is based upon the outcome of this experiment, Mr. Webb believes the Einstein theory is false.

Radio engineers will be interested in this author's explanation of the origin of side band frequencies in modulator circuits. It is here that the distinction between the use of mathematics as a tool for understanding nature or as a fundamental part of nature is most forcibly discussed. Rejecting the theory that Fourier analysis accounts for the generation of side bands in the vacuum tubes, Mr. Webb maintains that they are generated in the output transformer or other inductance in the circuit.

Chapter IX offers a new theory of gravitation. Instead of thinking of this fundamental phenomenon as a "pull from above" Mr. Webb believes it is a "push from above" caused by the pressure of this universal electric field.

Also challenging is a new theory of Magnetism. For students who have puzzled over the forces of attraction and repulsion present in permanent magnets or who have struggled with mysterious magnetic "lines of force" and with equally mysterious voltages which appear when these lines are cut by a conductor, Mr. Webb has an explanation. He states that the field of a permanent magnet is an electro magnetic wave of 200 trillion cycles, a wave length of about 1/17,000 inch, which is about three times the wave length of white light which is about 1/50,000 inch. The energy of this magnetic field is said to be supplied by the normal heat on the earth which is in the range of 500 degrees above absolute zero.

Throughout the book Mr. Webb has consistently tried to avoid the use of complicated mathematical formulae.

Because this book is such a diametrical departure from currently accepted scientific theory, the editor of SIGNAL would like the reactions, both pro and con, of readers.

A HALF CENTURY OF COLOR. By Louis Walton Sipley. Macmillan. $6.

The fascinating history of color photography and color reproduction, shown in the American Museum of Photography's biennial exhibit this spring, is now available in permanent and expanded form.

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Over 200 additional illustrations spread the whole history of color in the graphic arts before you—from the 3-color lithography of Louis du Hauron to modern Xerography, electronic color separation, and the most recent developments of 1950. Here are the famous "firsts" and the wealth of other early reproductions collected by the American Museum of Photography over the past ten years: Kurtz' first 3-color photoengraving, the first autochromes used in the *National Geographic*, the *Saturday Evening Post's* first color cover, pictures of the first color cameas, of offices and equipment of pioneering engravers and printers, and of famous events like the dinner given by *Camera* for Lumiere.

Our Book Department can furnish any book currently in print. We will also help to secure older titles that you may need to complete your library. A 10% discount is allowed all Association members on orders of $10.00 or more. Please indicate author and publisher where known, and allow three weeks for procurement and delivery.

Accompanying this pictorial display, Dr. Sipley tells the story of each new development, with many interesting facts about the men and firms that initiated each new process, explanations of the processes themselves and of the equipment used. He has unearthed new facts on the first use of various processes, and corrects a number of mistaken impressions about major events in the history of color reproduction.

THE WORLD OF SCIENCE. By F. Sherwood Taylor. Norton. Over 1,000 pages. $7.50.

This revised edition of a massive survey of research and technology now includes clearly written, informative material on the basic principles of radar, television, nuclear fission, and other new scientific developments. Not the kind of book many people will want to sit down and read, but it is highly valuable for reference use.

MATHEMATICAL SNAPSHOTS. By H. Steinhaus. Oxford University Press. 266 pages. $4.50.

295 illustrations take up fully two-thirds of this fascinating book which offers a wealth of interesting problems and information for both the general reader and the mathematician. Some problems are new, some old, but even the old ones are usually given a new twist. Varied enough to suit the taste of almost anyone. Only a few of the problems take more than a page.

Puzzles, space-filling curves, knots, packing apples in a box, end games in chess, proportional representation, the inflammability of emulsions are just some samples of its wide range of subjects. It's the sort of book you can open at random and always find an amusing picture or interesting story close by.

SCIENTISTS AT WAR. By Wilfred Eggleston. Oxford University Press. $4.

Several years ago this story of research conducted by the Canadian National Research Council during World War II might have been just an interesting historical record, but in view of the Korean War it may also be a picture of things to come. Mr. Eggleston, Ottawa correspondent of *The Manchester Guardian*, has the gift of describing intricate technology in a fast-moving, concise way that will hold the attention of scientists and laymen alike.

THE FIRST ELECTRICAL BOOK FOR BOYS. By Alfred Morgan. Charles Scribner's Sons. 263 pages. $3.

This excellent "first book" has been completely revised to make it even better than before. Of particular interest is a whole new chapter analyzing the latest developments in electronics, radar, and television.

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Automatic Electric

(*Continued from page 26*)

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Temco

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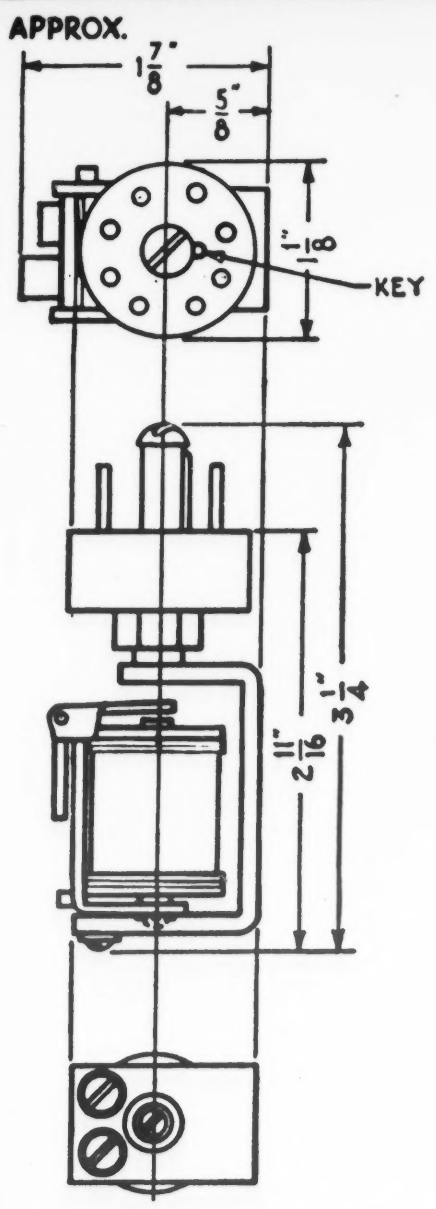

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